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The Farmer's Digest

Volume 12 January, 1949 Number 8

Seven-Point Program for Farm-Building Management

Condensed from Cappers Farmer

Deane G. Carter
University of Illinois

1—Make an appraisal of each building.

2—Start a long-range program for future changes.

3—Schedule repairs and improvements for several years ahead.

4—Keep a record of money spent for upkeep and repair.

5—Obtain up-to-date blueprints for new buildings.

6—Make a permanent farmstead plan for building location and arrangement.

7—Increase insurance if needed for reasonable protection in case of loss.

MANY a farm owner waited thru years of depression and wartime for a "better time to build," only to find that it costs about twice as much to build now as it did before 1940. Less building has been done in the last 30 years than is necessary to offset the wearing out of old buildings.

Meantime farm buildings have been outdated by changes in farming, and by such developments as mechanization, electrification and soil-conservation methods. As farm-labor costs go up, it becomes necessary to get better labor efficiency in and around buildings. New knowledge of production and crop processing demands better building design.

High construction costs cause many farmers to hesitate about putting up new buildings, or tearing down old ones as long as they can be repaired. It is possible, however, that new buildings should be planned regardless of cost, to avoid the penalty of losses occurring for the lack of suitable facilities. It may be that the dairy-

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man must have a new milkhouse to qualify for the Grade A market. It does little good to produce crops efficiently unless cribs and granaries provide safe storage.

These are some of the problems of farm-building management. Whatever is done involves questions of cost, value, and the return that can be expected from a building investment. It is not at all unusual now for a set of farm buildings to cost $25,000 to $30,000. (This is about today's contract price for a 6-room modern house, a 200-hen poultry house, a 5,000-bushel crib and granary, a machine shed and a small general-purpose barn.) Because money spent for farm buildings can seldom be recovered by an increase in the selling price of the farm, expenditure must be justified either by profitable use of the buildings, or by the personal satisfaction gained.

Three steps are involved in setting up a building-management program for your farm: (1) Actions that need immediate consideration. (2) An appraisal of farm-building values. (3) A long-range improvement plan. You may have given thought to these problems; at least you have most of the facts you need. Comments and examples that follow illustrate the practical application.

Carry enough insurance for protection in case of complete loss. Last spring we visited a number of farms where a tornado had wrecked all buildings. But the total insurance carried on some of these farms was not sufficient even to build a small modern home to shelter the family. Unless you have revalued your buildings within the last 2 years, the chances are you will want to increase the amount substantially.

Take depreciation of buildings as an expense in reporting income tax. You are entitled to a depreciation allowance on all buildings used for production at a reasonable rate.

Keep a record of expense for upkeep and repair. One job of painting or reroofing may amount to several hundred dollars. All repair expense is deductible in calculating income-tax returns. Moreover, if the expense record is kept year by year, the facts are useful in future planning.

Make a repair and improvement schedule for several years ahead. Farm managers tell us that one of their principal problems is that "the buildings are badly run down" and heavy expenses are necessary to put them in good condition. A planned program will provide a timetable for painting, repairing, roofing and replacing unsafe construction, and allow the distribution of expense over a period of years.

Obtain up-to-date plans before starting new buildings. Many new buildings are almost exact copies

of old buildings they replace. Horse barns and hoghouses, and to some extent some other farm buildings, must be radically different from older designs to meet modern requirements. Hay drying, crop conditioning, mechanical barn cleaning, and use of electrical equipment affects the building plan. In some cases the location and arrangement of buildings determine their effectiveness. State colleges of agriculture supply building plans at low cost, also free bulletins and circulars on building topics.

You need an appraisal of the present worth of your buildings, not only to fix a capital value for loans, insurance, and income tax purposes, but also to figure production costs, compare values, and settle estates. An appraisal does not have to be exact—a few hundred dollars either way will be close enough—just so that values placed on the various buildings are consistent.

Original cost is not altogether satisfactory for setting values. Sometimes the cost is not known. Values are not comparable if one building was erected in a high-cost year, say in 1929, and another in 1933 when costs were very low. Nor are today's costs a good index of value for buildings put up when prices were much lower. Perhaps the best estimate is obtained by taking an average, or "normal" cost, intermediate between high and low. An example of normal value is the 1940–41 cost level, which was in between the low of 1933 and recent highs. The table on this page gives 1941 state av-

TABLE OF NORMAL FARM BUILDING COSTS

Based on 1941 Illinois state averages for farm buildings.
Adapted from information by Illinois Tax Commission.

Building	*Cost in cents per cubic foot*
Dwelling, modern, with basement	25 to 35
Dairy barn, 1-story	11
Dairy barn, 2-story	7
General barn, 2-story	5
Cattle barn, 1-story	6
Hay shed, pole frame	4
Machine storage buildings	6
Cribs, bins and granaries	10
Central hoghouse	15
Poultry house, 100 hens or more	14
Milk house, approved for Grade A	25
Utility buildings, garage, etc.	14

(Costs in 1948 are almost double the above unit costs.)

erage costs for good farm construction in Illinois. Figures are given in cost per cubic foot so as to apply to buildings of different size. Cost data would likely be similar for other Midwest states or if desired, local cost estimates may be obtained from contractors, material dealers, real estate agents and loan agency appraisers.

The "normal" building cost is used to estimate the present value of a building as follows: Assume the normal cost to be the "replacement" cost, or the average amount needed to replace or restore a building to its original condition. Then the present appraised value will be that proportion of the replacement cost represented by the remaining useful value. To illustrate: A barn with a normal replacement cost of $3,000 is to be appraised. It is about 25 years old; in fair repair but not fully used on this farm. The best estimate is that at least one half the value should be written off. Then the appraised value is set at $1,500 (which is 50 per cent of $3,000). In another case, a 25-year-old cattle shed, having a pole frame, dirt floor and cheap roof, might be worth only 10 to 20 per cent of its normal replacement cost.

Time after time the need for long-range planning is emphasized by the questions and problems brought to us by farm operators, landlords and professional managers. These examples can be duplicated in almost any farming community: Silos that are never filled; poultry houses on farms that do not keep chickens; dairy stalls that are no longer used; central hoghouses that have been abandoned; machine sheds too small for modern farm machinery; and corncribs without a convenient way to fill or empty them.

These troubles are of the past, however, and are mostly due to changes in farming. But some of today's problems are just as baffling. Are we likely to bale or chop most of the future hay crop, or store it loose in the mow? Is the conventional slatted corncrib on the way out, to be replaced with mechanical drying equipment? Will more and more farm buildings be prefabricated? Will the arched roof replace the straight rafter frame? Will concrete, steel and aluminum be increasingly used instead of lumber? Or to take another point of view, will rising costs compel more farmers to grow their own building material in a farm timber tract or woodlot?

The most important step in long-range planning then, is to size up the farm itself—the probable program, market outlets, location, system of operation, and capacities needed. Then select plans, or decide on buildings to

fit the farm need, avoid unnecessary expense, and make each improvement useful to the farm.

If the future of the farm is considered and future trends in farming are analyzed as fully as possible, you are well on your way to long-range planning. Then the following suggestions are appropriate:

1. Make farmstead arrangement and location a definite part of the long-range plan. Work toward a 5-, 10-, or 15-year goal for arrangement of drives, windbreaks, fences and permanent building location.

2. Prepare a schedule of changes, in approximate order of need, altho not year by year, to cover at least a 10-year period. This schedule should include the following items: (a) Structures to be demolished soon; (b) Buildings to be torn down or replaced within 3 to 5 years; (c) Buildings to be used for a time with only minor repairs and then demolished; (d) Buildings to be repaired or remodeled to last indefinitely; and (e) New improvements to be made.

3. Review the whole building situation on your farm each year, and make such changes as are necessary in the long-range plan.

Noncaking Fertilizer

If you have ever stored fertilizer in moist weather, you can appreciate any fertilizer which does not cake. This is one of the qualities claimed for the United States Department of Agriculture's new, slow-acting nitrogen fertilizer, urea-form.

Stored in humidities up to as high as 100 per cent, one form of this fertilizer remained dry, even tho it absorbed a third of its own weight in moisture. Big hope of this research is that the noncaking fertilizer can be mixed with other fertilizers to act as a conditioner, in holding down the caking tendencies of the mixture.

Besides its noncaking characteristics, urea-form has other uses. Combined with a quick-acting nitrogen fertilizer, it gets pasture grasses off to a fast start, and keeps them growing all thru the season. The new fertilizer is not yet available commercially.

—Successful Farming

Why Do Cows Bloat?

Condensed from The Ayrshire Digest

Dwight Espe, N. L. Jacobson and C. Y. Cannon
Iowa State College

WHY do cows bloat on alfalfa or clover pastures but not on blue grass? Is there something in clover or alfalfa and not in blue grass or other grass pastures that causes bloat?

We can't answer those questions as we should like, but the studies we have made at the Iowa Station have given us some rather definite opinions. Here they are:

1. Bloating apparently is entirely a physical problem. We think it is because cattle sometimes eat too much of these legumes in too short a time. It is not because sweet clover, red clover and alfalfa contain a 'poison' or something that is bad and isn't found in grass.
2. Salt, soda, lime and similar 'bloat remedies' will not prevent bloat because they are too mild in their action. Remedies which are powerful enough to prevent gas formation interfere with normal digestion and should not be used.
3. Feeding grain, dry hay or silage before putting cattle on legume pasture will help prevent overeating and, in turn, bloat.
4. Turning cows on grass pasture for half an hour or more before turning them on the legume will help if the grass pasture is green and succulent so the cows will eat it.
5. Legume pasture with dew or frost on it may be more likely to cause bloating because it permits the cow to eat and swallow the forage faster. The dampened legume also may cut down the amount of saliva secreted, and saliva helps lessen gas formation.
6. As much gas is formed by blue grass, per pound of grass eaten, as per pound of alfalfa.

Regardless of what cows eat—hay, grain, blue grass or legume pasture—they are continually forming gas. Gases are formed which, if absorbed in sufficient quantities, may kill the cow. But normally a cow from time to time belches and rids herself of the gas. Apparently it's only when the opening from the stomach gets blocked with food that the cow

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Brandon, Vermont, May, 1948

starts bloating. After that we're not sure whether it's the pressure of the gas in the stomach, or the absorption of certain poisonous gases, that may finally kill the animal. In either case the important thing is to prevent the cow from eating so much so fast that the stomach can't 'mow it away' in the usual manner.

If a cow eats rapidly of a luscious legume pasture for a couple of hours she may consume 100 or more pounds of feed, our studies show. If she then takes a good drink of water and lies down to chew her cud and rest, conditions are ideal for bloating.

Our theory is that under conditions like this she has loaded up so heavily and gas forms so rapidly that the opening of the esophagus into the rumen is closed and the gas can't get out—the cow can't belch. So we think it best to let the cow drink before she goes onto legume pasture. If she has loaded up on legumes don't let her finish up with water.

We have had at the Iowa Station a cow with a rumen fistula—a hole healed up down into her rumen—so that we can look in and even reach inside the stomach to find out something about how she handles her food.

We used this cow in our experiments on bloat. She was fed fresh, green, young alfalfa, blue grass, and other feeds. Portions of these materials were then removed from the rumen (paunch) and tests run to determine what gases were formed. The gases formed by the green alfalfa were not greatly different in kind or quantity from those formed by blue grass.

Then we put this cow and others out on alfalfa and blue grass pastures, trying to produce bloat and to observe how the cows ate. We found that the cows on the alfalfa pasture were able to eat about three times as much per minute as when they were on blue grass pasture. To arrive at this, the cows were accurately weighed before and after pasturing and all excretions collected and taken into account.

The cows ate about one pound per minute of the young, green alfalfa but only about one-third pound of blue grass even on a good pasture. The reason for this, at least in part, is that the cows could pinch off the alfalfa, whereas grass had to be cut off against the sharp edges of the lower teeth.

We put blue grass and alfalfa through a meat grinder and found that a given weight of ground alfalfa formed a much more compact mass than a similar weight of blue grass. This probably is part of the explanation why one causes bloat and the other doesn't.

The cows used in our tests were fed a full-feed of grain in the evening and then were fed nothing

before they went onto the pasture in the morning. Under these conditions we were unable to get any of the cows to bloat at any time. They apparently just wouldn't eat enough of the alfalfa to cause trouble.

So one of the ways to prevent bloat, we think, is to see that cattle are not turned on legume pasture when they are very hungry. It is the filling up quickly with a heavy load of compact legume that seems to cause the trouble. Blue grass or other grass pastures are more bulky and the cows can't fill up so fast on them.

Recommendations have sometimes been made to feed cows on legume pasture a mixture of equal parts of lime, salt and soda to prevent bloating. When we tried this and removed some of the material, we found gas forming faster than when the mixture was not fed.

One of the California stations has recently reported work which they did on bloat, and their results largely confirm ours. They, too, are of the opinion that bloating is a physical problem—the cow does not belch up the gas formed.

The California workers say " . . . bloat is caused not by excessive gas formation but by interference with belching. In our opinion bloat most frequently results from absence of the stimuli (like scratchy feed) to initiate belching. Fibrous roughage is effective because prickly. This bloat seldom occurs on rations of hay and grain."

Why do cows on some farms go along for years without bloating and then a farmer may lose several animals suddenly? We don't have the answer, but it is probably tied up with this business of eating too much too fast.

Dry cows seldom bloat. It is usually the milking cows or growing animals with the large appetites that gorge themselves and have the trouble. But knowing all this, suppose the cow does bloat, what should you do for treatment? Keep the cow on her feet and moving if possible. To induce belching, put a bit in her mouth as you would a bit for a horse, or insert a piece of smooth, heavy hose in her mouth and *carefully* work it down the esophagus into the paunch. Be sure you don't get into her windpipe.

After the gas has escaped, drench the cow through the tube with some antiferment recommended by your veterinarian. Before drenching, elevate the front feet to remove pressure on the heart and lungs. An ice pack or cold water poured on the bloated side will tend to check fermentation.

The general idea in treating bloat is to prevent further formation of gas and to eliminate that already present. If the cow is

badly bloated and other methods fail, a trocar (or knife if a trocar is not handy) should be inserted in the left side at the highest point of the bloat. Do not remove the cannula covering the trocar (or rubber tube if a knife has been used) until all danger of bloat is past.

We can't afford to lose cows anytime and especially with the heavy demand for our meat supply and milk products. Feeding some bulky roughage before turning cattle on legume pasture and seeing that they are not too hungry or that they do not fill up with water when they are already nearly full of legume will help in prevention of bloat. But there just isn't any drug or a 'something' you can give that will solve this bloat problem so far as we know.

Keeping Old Bulls in Service

Condensed from Hoard's Dairyman

Dr. H. A. Herman

Professor of Dairy Husbandry, University of Missouri

HOW LONG can I keep him in service? This question is often heard as we gaze over the fence admiring a high transmitting bull. Naturally everyone who goes to the expense and effort to prove a bull aspires to keep him in service just as long as possible.

It is often said that the secret of success in developing a good dairy herd is long-lived, high producing cows. The same can be said of the sire. Most sires are not proved for production until they are 6 to 8 years of age, which means we have only a few years at best to utilize the sire after he is a known quantity as a breeder.

We must appreciate the fact that all sires have their individual differences. That is to say they are the result of their inheritance and environment.

At the University of Missouri we have had many bulls in active service past 16 years of age and the most recent, a Holstein herd sire Man-O-War 69th, was still very fertile at over 18 years of age. Obviously bulls of this kind are the exception. It is generally recognized that sterility in the bull may occur at any age but the pro-

Reprinted by permission from Hoard's Dairyman, September 25, 1948, Fort Atkinson, Wis.

portion of sterile bulls increases with advancing age.

The feeding and management of the bull has much to do with how long he lasts. Inheritance also plays a part. Generally long-lived bulls are found in long-lived families of cattle. In selecting sires this fact should be kept in mind.

If we are to profit by the research findings on care and feeding of bulls it is evident we must not neglect the young growing bull. The young bull must be fed sufficient quantities to keep him growing rapidly and at all times in moderate, thrifty body condition. This is not difficult. Feed plenty of good leafy, green, hay after 6 months, supplemented with a grain mixture of oats, corn, and protein supplement such as soybean oil meal, linseed, or cottonseed oil meal. With mixed hays a grain with 14 to 16 per cent crude protein is desirable.

Pasture for the young bull is highly desirable but should not be his sole ration, as he usually will not get enough energy for best growth. Research work at the United States Department of Agriculture and at Purdue University indicates that where bulls are poorly fed—or literally starved, particularly as youngsters, and where the feed is both insufficient in quantity and low in protein, minerals, and certain vitamins, the sexual development is arrested. *Permanent damage* may be done to tubules of the testes and likewise cysts may form in the pituitary gland (a part of the brain tissue which is responsible for endocrine control of many parts of the body including the testes) and the bull may never be a satisfactory breeder. Older and mature bulls apparently are not adversely affected by mild starvation or poor feeding for a short while.

The nutritional requirements for maintenance of high fertility in the bull are essentially the same as those for maintaining animals in good health. The pertinent points to bear in mind are:

Level of feeding—Bulls should not be fat, but in good *hard fleshed* condition. It is well recognized that when *animals are losing weight they are lowered in fertility.* When they are "on the build" fertility is raised. Thus we should strive to keep a bull a little on the thin order so that we may increase feeding slightly, say at the start of a heavy breeding period. The trend in the show ring to discriminate against overly-fitted bulls is well founded. A fat bull generally has poor fertility and a lot of time is lost in thinning him down for use. The assumption is of course that "a bull worth showing is worth using".

Protein—Protein is necessary in the bull's ration at a level of about 10 to 14 per cent or about

the same as for the dry cow. Excess protein feeding can cause sterility and degeneration of the testes in certain animals, but this is not likely to occur in the bull at our usual levels of feeding.

Vitamins—Most of the known vitamins are essential to reproduction, but our usual rations of hay, grain, and pasture or green feeds supply an abundance. Specifically we are often concerned about vitamins E, A, and C in the bull's diet. Vitamin E is present in our grain feeds in abundance. Vitamin C is present in green forages; the animal no doubt can synthesize some, and in cattle its use is not too well understood. Phillips and his co-workers at the University of Wisconsin have found lowered fertility and low vitamin C blood values associated. In some cases the injection of vitamin C has been helpful in both non-breeding bulls and cows. Vitamin A is necessary for successful reproduction, but it, too, is found in hays and green feeds and to a lesser extent in grain. Aged bulls on vitamin A deficient diets broke in bodily health before they showed marked evidence of infertility. They recovered on proper feeding. Young growing bulls, however, if not fed sufficient vitamin A may be *permanently injured*. Vitamin D is supplied by sunshine and dried roughages and is seldom short in the bull's ration.

Minerals—The usual minerals for health and well-being seem to meet all needs for semen production. Steamed bone meal and salt are the only mineral supplements used over a 40-year period at the University of Missouri in feeding dairy cattle. In choosing feeds for bulls, the problem is little different than feeding the dry cow.

Roughage should receive first consideration — Good quality, leafy, green, soft-stemmed hay cut before maturity is very desirable for bull feeding. Most dairymen like to feed about half legume and half non-legume hay. It is important to regulate the hay feed so as not to develop too much paunchiness on the older bulls as this may interfere with breeding. Usually about 1 to 1½ pounds of hay per hundred pounds of body weight per day is the schedule.

Grain rations usually consist of oats, corn, bran, and some high protein supplement with about 1 per cent steamed bone meal and 1 per cent salt. A ration used for many years in feeding bulls at the University of Missouri consists of:

	Pounds
Ground oats	760
Ground corn	600
Wheat bran	400
Linseed oil meal	200
Salt	20
Steamed bone meal	20
Total	2,000

The rate of grain feeding varies, but 6 to 10 pounds per day is the usual range and must be governed by conditions of the bull.

Pastures — Limited pasture is excellent for the breeding bull. In fact some of our older bulls suffer from a lack of green feed. To turn the bull out to lush pasture when he is in constant use, however, means he will eat less hay and grain and often lose weight. Generally a grazing lot of ¼ to ½ acre provides enough grass for the average bull. Silage is not recommended for bulls as its heavy feeding results in paunchiness and slowing up. Some feeders use a few pounds of grass silage per day for each bull more or less as an appetizer and it seems to give good results.

Watch teeth—As bulls become older their teeth wear down and they are unable to chew roughage sufficiently to permit proper action of the rumen and the omasum or (manyplies) with its grinding action. Consequently they do not derive the full food value from roughages. This is an overlooked point in too many old bulls and cows alike. Such animals respond in improved body condition if we cut down the roughage, make sure that which is fed is leafy and fine of stem, and step up the grain feeding. Usually soaked beet pulp helps these older bulls a great deal and keeps the appetite keen.

For instance, one of our Holstein herd sires, Man-O-War 69th, started losing condition at 16 years of age. He was fed thereafter mainly on grain, beet pulp, and limited hay with a few mouthfuls of grass he nibbled in a rather dry lot during the pasture season. He has continued breeding past 18 years of age on this feeding program. Of course this sort of program cannot be a panacea for every old bull but it pays to look at their teeth and help them out if the old grinders are about gone.

Exercise—Bulls must have exercise to stay in good muscular trim. This may be obtained in a number of ways. Often a good sized lot or paddock for the bull to roam is enough. Bulls kept in stalls a great deal however need to be exercised by special methods such as mechanical exercise. Semen production *and fertility* seem to be associated with the activity of the bull. At the New Jersey Station exercising bulls resulted in increased semen volume. At the Arkansas Station exercise not only increased the volume but also the livability of the sperm under storage conditions. Exercise also tends to keep the feet in good condition.

Watch feet—The feet and legs of old bulls often give trouble. Exercise will help to wear down the hoof and it also strengthens the legs. If the feet need trimming this may be done by placing the foot on a board and trimming the hoof with a long-handled chisel. Or the bull may be placed in a

stock, the foot trimmed, and the sole leveled off.

Foot rot, stone bruises, etc., may also be treated with the bull in the stocks. The stocks are an important part of equipment for every breeding farm. No one likes to risk casting or "throwing" a valuable bull.

Housing—The bull should not be pampered too much. A good strong exercise lot and a shelter or box stall where he can run in and out are ideal for most farms.

Use a breeding rack and chute —If the bull is taught to work on a breeding rack and in a chute it will usually cut down injuries due to service. Slick floors, muddy lots, etc., account for many injuries to the old bull and can be prevented.

Common sense management has a lot to do with keeping old bulls in service. Watching his feeding, rate of use, body condition, testing regularly for TB, brucellosis (Bang's disease), and guarding against venereal diseases are highly important.

Mechanical injury to the testicles often result in permanent injury to the tissues which produce the spermatozoa. Bruises, inflammation, etc., generally result in a feverish condition of the scrotal tissues and sperm formation is retarded or halted entirely, resulting in temporary to permanent sterility.

A bull's primary purpose in life is to produce spermatozoa—the kind from a genetic standpoint we govern as far as physically possible when we choose that bull. Maintaining that sire for a long period of usefulness and the production of highly fertile spermatozoa is an obligation not to be taken lightly and pays dividends in the breeding program.

Sweet Potatoes

Four of the sweet potato varieties tested at Bixby Experiment Station in Oklahoma produced dried feed equivalent to 100 or more bushels of corn an acre. B2934, a U. S. D. A. seedling, produced the most dry feed with 3.8 tons an acre. Oklahoma 1 made 3.5 tons. This station says the greatest net profit from the sweet potato crop at present will come from planting a desirable table type. The best No. 1 roots, which constitute about 60 per cent of the crop, can be sold on the fresh market and the remainder dehydrated for stock feed.

—Capper's Farmer

Breeder Selection

Condensed from Turkey World

Stanley Marsden
U. S. Dept. of Agriculture

THE SELECTION of breeding stock for desirable physical characteristics represents about half of a complete breeding program. The other half is selection for good performance.

Selection on body characteristics is done without the aid of pedigreeing or record keeping by looking at and feeling of the breeder candidates; selection on performance is done by pedigreeing, making observations, keeping records, then summarizing them and making selections based on family performance in respect to egg production, fertility, hatchability, livability, and rate of maturity.

It often is asked, how far can one go on a selection program without benefit of pedigrees and records. The answer frequently is given as, "not very far." However, great progress has been made through selection alone, both with chickens and with turkeys. We cannot breed for performance characteristics by physical selection alone, but we can breed for a desirable physical type, one which is capable of better performance, and therefore, is more likely to give it. The modern balanced, long-bodied, broad breasted turkey is a desirable type and one physically capable of good performance.

Heredity controls the shape, size, and color of turkeys. Likewise, it controls the performance. But the control over the color and conformation seems to be more powerful and more direct; hence, we see results quicker than we do when selecting for performance characteristics. A relationship, which in some cases is a genetic linkage, often occurs between certain characteristics. Sometimes, this relationship or linkage is useful; whereas, it may in other cases be an obstacle to a successful selection program. Examples of these relationships may be seen in the Broad Breasted Bronze turkey, which in the early stages of its development was selected very closely for great width of breast without much regard for length of body or for placement of the legs. A beautiful fleshed turkey was produced, but due to an apparent relationship between broadness of

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breast and low reproductive ability, the new breed was found to lay fewer eggs which were less fertile and less hatchable than was desirable from an economic standpoint. However, when these big broad turkeys were trapnested and the eggs pedigreed, it was found that *not all* the good-type birds were poor reproducers; in fact, many of them were excellent in this respect, which gave hope that good reproductive ability could be bred back into the stock by selecting for a type capable of good reproduction or by using pedigree breeding methods, or a combination of the two.

Balance. Not so long ago, it was noted by alert observers in the research field that certain fully broad breasted birds carried themselves better than others, and that these up-standing, high-shouldered birds were more fertile and even appeared to show better hatchability. A study of their conformation showed that the up-standing, high-shouldered specimens had their legs placed a little further to the front of the body, which resulted in the keel, when it was of normal length, extending back between the legs fairly well. Thus, when the bird was hung up by the legs, it presented a compact, tucked-together appearance. This desirable condition was aptly termed "balance" by its discoverers, and it has proved to be a powerful aid in improving the broad breasted strains.

Good balance, while vital to good reproductive ability in the large broad breasted strain is scarcely less important in other types of turkeys. It should be one of the main selection points in all strains of turkeys, for the balanced bird is not only likely to be a good reproducer, but it is a better looking market bird. The balanced bird will show a body of reasonably good length; it will stand high at the shoulders; and it will be able to walk easily and smoothly without waddling, limping, paddling, or sagging at the shoulders.

Breeder selection on physical points can be done quickly and efficiently by an experienced operator. An assistant holds the bird by both legs with the hocks even with each other. The selector places one hand on the breast, the other on the back. In one operation, he checks the back for straightness, width, and relationship to keel (it should be about parallel to it) and appraises the breast for width, length, knobbiness, balance, and straightness of keel. Parting the breast feathers to expose the keel bone is necessary. He checks size and plumpness of drumsticks and thighs, and notes shanks, hocks, feet, and crop for defects. The bird is then laid on its breast, and the selector checks the wings, plumage color,

and head. If the bird passes all tests to this point, it is set on the ground or floor and forced to walk straight away from the observer for a few feet before it is lost in the flock. In this walking test, the selector or his assistant looks for (1) upstanding carriage, (2) natural unimpeded gait, and (3) normal legs and hocks. If the bird is considered undesirable, an assistant can shunt it into the cull pen or catch it with a hook.

There are, of course, other possible variations in this technique, but the application of the principles outlined should result in careful and accurate appraisal with a minimum of time required. With a good crew, a selector can accurately select turkeys at the rate of about 180 per hour if he checks posture and gait. If he does not have to supervise the walking test, he can step this rate up to about 300 per hour, provided that none of his time is consumed in operations other than selecting.

Head and neck. The head of the turkey normally is not eaten, but a combination of refinement and strength as seen in the head seems to go with good reproductive ability. Coarseness and heaviness of the head may go with heavy fleshing, but they seem to indicate late maturity and low reproduction. Weak appearance of the head likewise is undesirable. The best strains of light, medium, and heavy turkeys have trim, but rugged looking heads. Some defects to look for in the head are: Eyes off-colored, elongated, dull, sunken, injured, blind, or missing; beak crossed, elongated, or shaped like an ostrich's; face crew shaped (elongated and shallow), sunken, or coarse; skull with a knot or crest. The neck should be of moderate length, neither real short nor real long.

Back. While the back does not contribute much meat, it should be relatively broad and flat in order to provide the necessary bony structure to house the vital lungs, kidneys, and reproductive organs. Defects to look for are crooked back, roach-back (arched instead of straight), and narrowness, especially over ribs.

Breast. The broad breasted turkey is characterized by heavy fleshing in all sections of the body, but it is the wide, smooth breast that has made it famous. Selection for desirable breast type is of first-rate importance in all varieties of turkeys, but blind selection only for width can result in an undesirable type of turkey, one that is too wide and shallow and usually too short, so that normal walking or breeding is impossible. Back and breast should be about parallel to each other. The breast should be of good length, its rear point extending well up between the legs (indicating good balance); of good width, the width carried out well toward rear of

keel, but still allowing the bird to walk normally; and of good depth, not flattened out and shallow. The keel should, of course, be straight, the fleshing smooth and coming up well around it in all directions so as to eliminate ridge or knob. Some breeders have been selecting for a "dimple" which is a condition where the flesh actually comes up higher than the keel, so that the latter lies in a trough of flesh. This condition, if the bird still has sufficient depth and length of keel, is desirable, but not mandatory in a good broad breasted turkey.

Knobbiness is a common defect in nearly all turkeys and must continually be eliminated from breeding stock. True knobbiness is a condition where the flesh cuts away from the front and sides of the forward tip of the keel bone. When the knob is combined with a bad roost dent, a startling deformity is the result. In any case, a real knob spoils the appearance of a market turkey, and nothing breeds more true. Some selectors do not know what constitutes true knobbiness, and, while they may spot it in the toms, they often overlook it in the hens. Parting the feathers of the breast to expose the keel will reveal any tendency toward a knob.

A roost dent is a non-lateral curvature of the keel just back of the forward tip. While undesirable, it is not nearly so serious as a knob, as it usually is caused by faulty nutrition or management. However, it is best to eliminate all specimens with dents over ¼ inch deep.

When examining the breast, be on the lookout for the following defects: Heartshaped breast; prominent keel (flesh not surrounding it fully and smoothly); short keel; rear of keel pushed in or out (back and keel not parallel); knob; roost dent; curved or crooked keel; rocker keel; pendulous crop; breast callus; breast blister; and off-color (sometimes males have female-colored breast feathers, and females male-colored feathers.

Legs and feet. Fleshing of the thighs should be full, rounded, and of a size commensurate with the size of the bird and the breadth of the breast. Shanks and toes should be straight and strong, but not coarse, and of moderate length, neither too short nor too long. The following defects may be found: Thighs undersized or straightsided; shanks too long or abnormally short; off-colored shanks or feet; crooked toes; twisted shank; deformed backs; bow-legs; and knock-knees. Extremely short shanks occasionally occur and may be caused by a semi-lethal characteristic resulting in very low hatchability.

Wings and tail. About the only defects seen in these sections are split wing, twisted wing or tail

feathers, and off-color. Wings of males should not be slipped. Split wings are an unsightly defect and tend to breed true. While not common in turkeys, they do exist and should be eliminated from all breeding stock. A split wing is a permanent gap between the primaries and secondaries of the wing, usually causing the former to protrude when the wing is closed.

Color. Color of plumage, legs, and feet is important in maintaining variety characteristics and flock uniformity. Reasonable adherence to standard requirements is a good rule to follow. Color in white turkeys is no problem. Ignore grey and black in the plumage unless it is present in conspicuous quantity. There is no color Standard for Broad Breasted Bronze; hence, little attention is paid to color in this variety.

Size. Variety standards for weight and various ages have been set up for use in the National Turkey Improvement Plan. At present, their use is optional. They include only minimum weights for all except small-type turkeys for which maximum and minimum weights are provided. The Standard of Perfection specifies weights for both sexes, young and old, but these weights, at best, are only guides. There is no weight Standard for Broad Breasted Bronze, but the weights listed in Turkey Management (*Marsden and Martin*), pages 77 and 339, are representative of this variety and of the other varieties as indicated. The individual breeder has great latitude, but no matter what size is decided upon, breeding stock should be selected according to a definite Standard in order to produce uniformity. Specimens decidedly overweight or underweight for their age should be culled out.

Skeletal proportions. Actual measurements of body depth, keel length, and shank length are seldom practicable, but the selector should establish a rough Standard of measurement by using his spread hand. At market age, the keel bone should be almost equal in length to the shank; the nearer equal, the better. At age of first egg and later, the keel should be fully as long as the shank or a little longer. Body depth from front tip of keel vertically to the surface of the back should be about 1/5 greater than length of keel in all except the Beltsville Small White and other small varieties, in which it should be about ¼ greater. Guard against short keel and lack of sufficient depth.

Quick maturity. Relatively quick maturing turkeys are more efficient in the utilization of feed and labor than are their slower maturing brothers. Three items are important in determining rate of maturity: Age, fat in the skin, and pin-feather status. Age in

weeks must be known and the birds must be selected, under normal conditions of rearing, between 24 and 30 weeks for large- and medium-sized strains, and 22 to 26 weeks for small-sized strains. Within these age limits, the variations in rate of maturity can be discerned, rejecting those birds that show late maturing propensities, as indicated by poor finish and many short pinfeathers.

Generally speaking, toms of large- and medium-sized strains should reach U. S. Grade A condition in respect to finish and feathering, at 28 weeks of age; females at 26 weeks. Beltsville Small Whites, both males and females, should reach U. S. Grade A at 24 weeks. If market maturity can be reached sooner than the ages mentioned, so much the better.

Fat in the skin *between* the two feather tracts on the side of the breast largely determines the U. S. Grade so far as finish is concerned, because a bird finished at this location will be finished elsewhere. Therefore, we test this place rather than try to make an all-over appraisal. Proceed as follows: Have an assistant hold the bird so that breast skin is relaxed, then pluck a few feathers from the sparsely feathered area between the two feather tracts of the breast at a point just to rear of a line drawn from shoulder to front point of keel. Take a fold of the skin between thumbs and forefingers of both hands. U. S. Special (AA) turkeys will have a creamy skin, a fold of which (containing a double thickness of skin) is at least .14 inch thick; U. S. Prime (A), at least .07 inch; U. S. Choice (B), at least .04 inch; and U. S. Commercial (C), .03 inch, or less. This test is effective only at the point described. Ignore fat in skin at other places on the body.

Pinfeathers too short to be picked without leaving a stub in the skin are an important item in the determination of market grade. A bird may have a good finish and still be decidedly pinny. Such a bird cannot be considered as fully early maturing, and cannot be graded "A" or "AA." As a rule, however, a bird having sufficient fat in the skin to grade "A" will not have enough unpickable pinfeathers to bar it from the Grade.

Make More Beef from Grass and Hay

Condensed from Successful Farming

A. J. Dyer
University of Missouri

We are entering a pasture-farming era. Our acreage of corn will be sternly reduced; our acreage of hay and pasture must be greatly increased.

Farmers realize that grass and hay crops are essential in keeping soil at home and maintaining or increasing its fertility. They know better than anyone else, that income must be maintained, no matter what new crops or what new systems of farming are used.

Switching from corn and other ready-cash grain crops to hay and pasture raises many important problems. Of first importance is the question, "What system of livestock production can be used so that pasture and hay will replace grain in the fattening process?"

Sheep and cattle are the best "lawn mowers" and "hay balers" known. So, we must develop better sheep and cattle—and give them better crops and wider opportunities to convert roughage and pasture into meat.

In this account, I want to tell about a system of fattening cattle, developed at the University of Missouri, and now in use on many farms in the state. The system makes wide use of roughage and pasture.

Three trials already have been completed at the University of Missouri Agricultural Experiment Station. In each trial, fat 2-year-old steers weighing 1,150 pounds and averaging "Good" in the carcass have been produced with not more than 10 bushels of corn per head. That's the amount of corn fed from the time they were obtained as calves weighing about 400 pounds, until marketed at 1,150 pounds.

Of the total increase in weight (750 pounds), approximately 60 percent was made on pasture, 20 percent on roughage in winter, and 20 percent in dry lot on a full feed of grain.

We always have used steer calves, choice ones. As cattle grow older, the rough ones look rougher and rougher. Smooth-turned cattle with inherent ability to fleshen are necessary for greatest success.

At the market, well-rounded conformation pays big dividends. A good-shaped steer will get that

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way with a minimum of corn being fed; a slab-sided steer with a thin quarter will require much corn or excessive fat to be desirable in conformation. Superior conformation replaces corn.

Cattle of nondescript breeding have no place in this system where full use is made of roughage and pasture, and where cattle are sold in the fall. This is the time when good cattle sell at a premium.

Our standard ration in winter feeding has been corn silage and legume hay. We realize many feeders don't have silos, so let me hasten to say that about the same results can be obtained by feeding good-quality legume hay alone. Last winter, by adding from 2 to 3 bushels of corn with soybean meal (10 parts corn to 1 of meal) to a ration of legume hay, we produced as much gain as with corn silage and legume hay.

The quality of roughage, or of any feed, strongly influences the rate of gain. A high-protein feed —either soybean, cottonseed, or linseed meal—could be used to increase the daily rate of winter gain. We've obtained an increase of ¼ to ½ pound daily gain for each pound of any one of these three protein supplements added to the roughage.

If calves gain from ¾ to 1 pound per head daily during the winter, they make fullest use of pasture the following summer. That rate of winter gain can be acquired by almost any feeder who keeps thrifty cattle, and feeds a good winter ration.

A much larger gain can be made rather easily, but the extra feed used is practically wasted. Cattle making the larger gain often will weigh no more by fall than those wintered so as to gain only ¾ to 1 pound per head daily.

In our experiments, a mineral mixture consisting of equal parts by weight of limestone, bonemeal, and salt was provided all during the winter.

It's the gain made from pasture which helps greatly to "cheapen" the cattle. When 60 out of each 100 pounds gain are made from pasture, the feeder has a good chance to make some money. Barring a run of bad luck, this is true, even if the feeder calves are bought at a rather high price and grain feeds are expensive.

Our pasture season usually runs from April 15 to October 1. But we are trying to lengthen the grazing season by using a greater variety of pasture plants. We have found that bluegrass in the fall, after the lespedeza is gone, does not provide enough nutrients to make cattle gain very much. Sometimes, cattle don't even maintain their weight. We are trying to find out what crops are best here. Some look promising.

We usually graze one yearling steer per acre. On the average,

we've obtained in return at least 200 pounds of beef gain per acre.

More productive land would produce a much greater gain than this. Much of the land we used would produce only 15 bushels of wheat and 25 to 30 bushels of corn per acre. With grain even at its present price, the return per acre in value of beef gain equals or exceeds the return per acre of grain crop. This is in addition to the smaller amount of labor involved.

Briefly, the gain made at different ages, when the cattle are wintered thru 2 winters and grazed thru 2 summers, are as follows: 100 pounds gain the first winter; 200–250 pounds the first summer; 150–200 pounds the second winter, and 250 pounds the second summer.

We have been able to market some cattle at 2 years of age without any grain feeding. But the majority requires some grain. They usually take 10 bushels or less, and weigh 1,150 pounds or more when sold.

Some feeders object to this system of management, saying that they don't want to keep cattle that long. Others praise it highly, realizing that as cattle continue to gain on pasture and roughage, the selling price necessary for a profit becomes lower and lower.

But the plan is quite flexible. If the feeder doesn't wish to use the plan for so long a time, he may "pull out" from roughage and pasture. Then he can give a short feed of grain to the cattle and still benefit from having "cheapened" the cattle by use of roughage and pasture.

We'll add a word here about the degree of finish to which we take these cattle. After all, there's a limit to what you can do with roughage and with pasture.

We carry our cattle only to a grade of "Good." For many years, we haven't made any "Choice" or "Prime" cattle.

From the standpoint of farmers who pay for the feed required to fatten the cattle, and from the standpoint of the persons who pay for the meat to adorn the dinner table, cattle of "Good" quality are best. The expense is almost prohibitive to add the fat needed to make cattle grade "Choice" or "Prime."

From the standpoint of the thrifty housewife, "Good" grade beef is best. This is true because there is so much less waste; yet the meat is tender, nutritious, and palatable. In taste and cooking tests made on meat produced from the steers in our feeding trials, high ratings were made by home economists and official meat graders.

From the standpoint of economy and good land use, a pasture and roughage program is of highest value. This method points a way to increase farm profits thru lowering the costs of production.

Hog Mange

Condensed from Better Farming Methods

Martin H. Muma

Associate Entomologist, University of Nebraska

THE condition, known as mange, is a common ailment of hogs. Frequently, it is a limiting factor in the production of high quality pork.

Animals infested with mange mites are restless, rub frequently, eat more food, grow slowly and produce low quality pork. Little pigs are stunted and may be killed with heavy infestations.

Tests conducted during the winters of 1946–1947 and 1947–1948 in Nebraska have revealed a new simple single treatment method for the control of common or sarcoptic mange. The treatment consists of a single spraying with one-quarter of one percent of the gamma isomer of benzene hexachloride.

Complete coverage of the animals is necessary. Hogs sprayed in a small pen or house with a power sprayer will climb over each other, wetting themselves completely. When a knapsack or compressed air sprayer is used the operator should be careful to do a thorough job. Dipping insures complete coverage. When the spray method is used, particular care should be taken to spray inside of the ears.

As wettable powders of benzene hexachloride contain varying amounts of the gamma isomer, the percentage of the isomer present must be known before the spray is mixed. The following table gives the proper amount of several wettable powders to use with 5 and 50 gallons of water.

For 5 gallons of water:	
.84 lb.	12% gamma wettable powder
1.00 lb.	10% gamma wettable powder
1.65 lb.	6% gamma wettable powder
2.00 lb.	5% gamma wettable powder
For 50 gallons of water:	
8.4 lb.	12% gamma wettable powder
10.0 lb.	10% gamma wettable powder
16.5 lb.	6% gamma wettable powder
20.0 lb.	5% gamma wettable powder

No data have been collected on the use of benzene hexachloride for the control of demodectic mange on hogs. A recent test on the control of demodectic mange on dogs showed that mites of this type may also be controlled with benzene hexachloride. The same dilution of the gamma isomer was used and excellent control was obtained. Although this test on dogs does not mean that com-

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parable results would be obtained with hogs, it certainly indicates the possibility.

Only one test directly designed to control hog lice has been conducted. Observations on lice have been made, however, on all herds treated during the hog mange control work. In every case observed, lice as well as mange were controlled with the gamma mixture given above.

Benzene hexachloride has a very strong, pungent and musty odor. This quality of the material causes a burning of the eyes, nose and mucous tissues while the spray is being applied. The burning does not continue, however, and no after effects have been noted. Some concern over the absorption of the odor in hog meat has been expressed. No evidence of absorption has been found by comparative tests. It is felt, however, that treatment of breeding stock to prevent infestation of market animals is preferable to treatment of the pig crop. Where treatment of the market animals is necessary this should be done several weeks before marketing. As little is known concerning the toxic effects of benzene hexachloride, dilutions stronger than one-quarter of one percent of the gamma isomer should not be used.

Normally two kinds of mange may be found on hogs. Common or sarcoptic mange is caused by the sarcoptic mange mite. This mite is a whitish round-bodied parasite about one-fiftieth of an inch long. Although they are nearly invisible to the naked eye, the mites may be seen when infested scrapings are placed on a dark background. They spend most of their lives in tunnels and burrows beneath the surface of the skin of the animals. Occasionally, the young mites and adult females leave the burrows and wander over the surface of the body. Eggs, laid in the tunnels, hatch in three to ten days and the young mites mature in ten to twelve days to complete the cycle.

The second type of mange is known as demodectic mange. The mites that cause this type of mange are not nearly as common as the sarcoptic mite. Demodectic mange mites are microscopic, whitish, worm-like mites that infest the hair follicles and oil glands of the skin where they spend their entire life cycle. Little is known of the life history of this mite.

The symptoms or signs of mange vary with the type of mite. In the early stages of sarcoptic mange tiny, pimply, granular lesions appear around the eyes, ears and nose and occasionally on the under parts of the body. As the case advances the pimply areas spread and grow together. In old or advanced cases typical dry,

scabby areas extend all over the body. Infested animals lose hair by rubbing and the infested areas become bare and scurfy. Heavily infested animals have these areas covered with a thickened, wrinkled hide which gives rise to the frequently used name "elephant hide."

In the early stages of demodectic mange the affected areas become red and scurfy with small hard nodules of variable sizes. These nodules appear on the snout, eye lids and other parts of the body where the skin is tender. As the infestation progresses the nodules break, discharging a lumpy pus. In severe cases, two or more adjacent nodules may break forming deep suppurating sores.

In the past the control of mange has been difficult at best. Control of sarcoptic mange depended upon a series of three to five treatments at ten-day to two-week intervals, combined with strict sanitary measures in the hog house and lots. Treatments for sarcoptic mange included dipping in a vat which had a two or three inch layer of crude petroleum oil floating on the surface, spraying with crude oil, thinned with kerosene, or spraying or dipping with a mixture of lime-sulfur at 95 degrees to 105 degrees F. For demodectic mange the common practice was to dip frequently with crude oil and market the animals as quickly as possible. Both control treatments were supplemented with frequent cleaning and disinfecting the hog house and lot.

New Royal Wheat

About 50,000 bushels of new Royal wheat will be available for seeding the 1949 crop. Growers in 40 counties in south-central and southern Illinois seeded 1,520 acres in 1948 and University of Illinois produced seed on its farms. The new soft wheat is winter hardy and stiff-strawed. It averaged 34.2 bushels an acre for Illinois growers in 1948.

—Capper's Farmer

Crop Improvement by Seed Certification

Condensed from PhilFarmer

J. C. Hackleman
Illinois Crop Improvement Assn.

CERTIFICATION of seed is an organized plan for the increase and distribution of seed that has for its major purpose the supplying of farmers with high quality seed of superior crop varieties. Certified seed is to the cropgrower what registered livestock is to the stockman. The aim of both is a guarantee to the purchaser that he is obtaining foundation stock, whether it be seed or livestock, that is of a pure strain. Alert farmers who realize the great improvements that are being made in crops appreciate it, and more and more are demanding "Certified Seed."

The program of seed certification was launched in the United States 30 years ago for three purposes, (1) to maintain the purity of the new crop from the time it left the originator or plant breeder until seed of it was available to supply interested farmers throughout the area of adaptation, (2) to acquaint the producers of the new crop with its varietal characteristics and thus encourage them to assist in keeping it pure as to variety and (3) to help the producer realize the importance of weed control, aid him to recognize the more serious weeds and advise him on the best methods of control.

Prior to the launching of the program of seed certification, new creations of the plant breeder were released to farmers in small quantities, from a few pounds to a few bushels at the most. Many of the new crops released under this old system soon became so badly mixed that they lost much of their original value.

With the inauguration of the program of certification, several changes in procedure took place. First, instead of distributing small amounts of foundation seed to a number of growers, each of whom obtained only enough for a small plot, the original lot of seed was increased at least once more in closely supervised fields or plots. This then made it possible to allot farmers larger amounts of seed, enough for field units. These farmers' fields were then inspected, prior to harvest, by trained inspectors who advised the grower as to the purity of his

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grain, and if impurities were found, he was shown how to "rogue" out these admixtures and thus improve his seed. In addition, the inspectors were constantly on the "lookout" for weeds, and the grower was advised to remove those before harvest. After the harvest, a representative lot of the recleaned seed, ready for sale, was taken to the State Crop Improvement Association Office where it was tested for purity and germination.

Since seed certification is limited to those varieties which are tested and approved by State or provincial agricultural experiment stations, only superior varieties are recognized. Thus the farmer who is interested in obtaining seed of a new variety can rest assured that it is adapted if it is certified in his state or province.

The fact that a variety of grain may be eligible for certification in Idaho, Utah, or Canada is not a guarantee that it is adapted to the Corn Belt or the East. Varieties adapted in a given state will be approved by the State Experiment Station and recommended to the Crop Improvement Association for certification.

The value of seed certification is becoming more important with the release of each new creation of the plant breeder. If the seed characteristics of each and every variety were so distinctly different that their positive indentification could be assured, certification would not be as important. Naturally, seed characteristics alone cannot be depended upon. It becomes necessary to have some form of registration and certification to protect the buyer, whether that be the seedsman who wishes to handle seed of a particular strain or variety, or the farmer who wants to plant it.

Just a few illustrations will serve to show the necessity of some form of seed certification. Seed of Buffalo and Ranger Alfalfa, both of which are winter hardy and highly resistant to bacterial wilt, cannot be distinguished from the kinds which are neither winter hardy nor disease resistant. No seed analyst professes to distinguish between the seeds of Ladino and common White Dutch clover, and yet one sells for three or four times the cost of the other. The seed of Kenland, a new strain of red clover that carries considerable resistance to Southern Anthracnose is indistinguishable from other red clovers which are very susceptible to this disease. No farmer who is attempting to insure his crop production program can afford to take chances on seed of doubtful or unknown variety.

That certified seed is being more fully understood and appreciated by seedsmen and farmers alike is proven by the fact that

more than 30 thousand farmers in 41 states had seed inspected for certification in 1947. The list of crops inspected includes practically every seed used on the farms of the nation. As new and improved varieties of legume and grass seeds are released by the plant breeders, this list will be expanded still further.

Why Deep Houses are Better

Condensed from Everybodys Poultry Magazine

Robert C. Baker

Most of the chickens in the United States are kept in flocks of less than 250 birds. It requires small poultry houses on many farms to house these flocks. Most of these small houses in the past have been narrow, 20 feet wide or less. Such houses get cold and damp in the winter. Experience has shown that it is easier to keep the house warmer and the litter drier when deeper houses are used. Deep houses also require less building materials, and it is easier to care for the birds.

The popular 20 by 40 poultry house requires 120 running feet of wall space. It has 800 square feet of floor space and will house 200 heavy pullets or 250 Leghorns. A 30 by 30 house also has 120 feet of wall space. But with the same amount of wall space, the 30 by 30 house has 900 square feet of floor space, 100 more. The deeper house will care for 225 heavies or about 300 Leghorns.

With the deeper house, less wall space is required for the same number of birds. This makes a direct saving in housing costs per bird. And the less wall there is exposed to the outside cold air in the winter with a given number of birds, the warmer the house will be.

I recently visited a poultryman in western Pennsylvania who was trucking away dirt to build a poultry house 100 feet long and 15 feet wide. He decided on the 15-foot depth because he was building on a slope and it was expensive to get the dirt hauled. With the aid of pencil and paper, I explained that an 85 by 30 house

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would give him the same amount of wall space but would allow for 1050 more feet of floor space. The same amount of wall space would allow him to house 300 more birds in the deeper house. He hadn't realized that a deeper house could make so much difference in the number of birds housed.

J. C. McCoy of Emlenton, Venango County, Pennsylvania, told me a short time ago that he started in the poultry business with a poultry house only 16 feet deep. He now has a 60 by 30 house, four stories high. His opinion of the narrow house is well illustrated by the fact that it has stood idle for several years. Mr. McCoy estimates that he saved approximately 35 percent, on a housing cost per bird basis, by building the deeper house because he could house more birds with the same amount of wall space. He also allows less floor space per bird in the wide house with excellent results.

Poultrymen with narrow houses have found that it is difficult to keep the floor dry. One of the main reasons for this is the fact that a narrow house doesn't allow ample air circulation. The principles of ventilation are simple. Fresh, cold air enters the house, either through the windows or intake flues, and because it is heavier than warm air, drops to the floor. As it is warmed by the chickens, it rises and picks up moisture. The warm, moist air goes out through any ventilating opening that may be provided.

Some houses use only the windows for intake and outtake of air. Deeper houses allow the air to circulate more freely within the room. In a narrow house, the air starts circulating but can't complete its course without hitting many obstructions. A narrow house usually does not allow enough room for proper circulation.

Deep houses are usually warmer than narrow houses if the same outdoor conditions prevail. A deep house takes longer to cool off. In the winter months cold air strikes all sides of a house, regardless of how deep it is. If the house is deep, it takes longer for the cold air to penetrate and cool off the inside.

When a house is warm, it is comparatively easy to ventilate. If the house is cold, it is more difficult to keep litter dry. Warm air holds and carries off moisture, while cold air doesn't. For every 17 degree increase in temperature, the water-holding capacity of the air doubles. In cold houses, little air circulates because there is almost no warm air, which is light and can rise. The little circulation that does take place carries off practically no moisture.

Birds drink large quantities of

water each day and much of the water is deposited in the litter through the droppings. Professor J. W. White and his associates in the agronomy department at The Pennsylvania State College found that fresh droppings contain 76 percent water. White also found that laying hens deposit about two-thirds of the droppings in the litter and the other third under the roosts. If the moisture is not carried away by the air, litter remains wet.

With deep houses, it is possible to have large pens and thus have a more satisfactory arrangement of equipment, nests, and perches. With larger pens, the nests can be arranged all on one side of the pen near the door, to make egg gathering easier and quicker. The roosts can be placed in the middle of the pen, or at least away from the rear wall, so there is less danger of drafts from rear windows. There is not enough room to put the roosts away from the rear wall in shallow houses. Big pens will allow for fewer water fountains. Deep houses mean larger pens and fewer doors. Doors are not only more satisfactory from an arrangement standpoint, but save on labor, since it takes only little longer to care for a large pen than it does for a small one.

The trend definitely shows that the day of the narrow poultry house is past. Poultrymen have learned from experience that narrow houses are hard to keep warm and dry. It is almost impossible to keep litter dry in a poultry house less than 20 feet deep. The 20-foot farm flock houses which still are popular are losing ground to the deeper 24 or 30 foot houses. Some of the larger commercial poultry growers are now building houses 36 to 40 feet deep, or even more.

Rat Barrier

Rats turn away from a new board that contains a substance they don't like. The board is the laminated type having a hardwood veneer with impregnated fiber faces. The board is nonpoisonous and has been named Protekwood. (United States Plywood Corp.)

—Capper's Farmer

Rain by Telephone

Condensed from Country Gentleman

Buckley Maits

IRRIGATION is an old story to many a Westerner and not so unfamiliar, either, to some of the big specialty growers of the East. But it's all still new to many thousands of farmers in supposedly well-watered sections—farmers who don't depend on irrigation to make a crop but who could nevertheless use an extra few inches of moisture to good advantage during a dry spell. Until recently, man-made rain has been pretty much in the rosy-dream class for most of these farmers because of the trouble and expense of pipes and pumps, ditches and dams, sprinklers and spreaders.

Now, however, with pumping equipment on wheels and lightweight pipe of the kind one man can haul from place to place and hook up quickly, large numbers of farmers are building ponds, terrace systems and other water-holding structures with confidence in their ability to obtain rain-making machinery at a reasonable price. From New York to Georgia, I have talked with scores of farmers who have found it saves feed costs and boosts crop yields to make, or rent, artificial rain when Nature passes them by.

In South Carolina, you can even order rain by telephone, if you wish. There's a man at Winnsboro who has gone into the custom irrigation business this year. His name is John McLeod and he owns about $12,000 worth of portable irrigation equipment which he will lug anywhere in the state by truck and jeep to lay down an inch or more of water on a thirsty peach orchard, strawberry patch, cornfield, or what have you.

The day I saw him he was getting ready to load his 10-wheel Army-surplus truck with pipe for a run to an orchard near McBee, some 60 miles away. The McBee orchard was a big one, quite some distance from a good water supply, and so McLeod figured that the truck would need about four trips to haul the 4800 feet of 5-inch mains and the 2600 feet of smaller lateral (or sprinkler) line required. On the final trip, the six-cylinder, trailer-mounted fire pump would tag along behind his jeep while his assistant, Bill Boulware, drove the truck.

The pump—worth about $1100 new, or $300 to $800 if you are lucky enough to get it from Army

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surplus and put in a set of bronze rings and fittings for irrigation work—can deliver 500 gallons a minute with 50 pounds' pressure. This will run 33 sprinkler heads covering 1¼ acres at a shot, McLeod says. It takes quite a while (maybe a half day or even more) to set up pipe and pumper, of course. But once it's ready to go it can put on an inch of water in about an hour. Then, it's not too hard to unhook the 20-foot sections of pipe and move the laterals around to another part of the orchard.

For the McBee job, on which he had already made one flying trip to reconnoiter the water supply and lay of the orchard, McLeod was going to charge $22 an acre and put on an inch or two of water. "That's about 22 cents a tree," he said. "You can figure for yourself if water is worth that much to a peach grower when he runs into dry weather during pit-forming or fruit swell."

To the south, in Georgia, is where portable irrigation has really taken hold though. The rainfall averages 50 inches for the year (four more than for South Carolina) but Everett Davis, traveling irrigation engineer for the Georgia Extension Service, estimates that nearly 175 farmers have bought rigs. Quite a few are using them on tobacco, pecans, corn and pasture. Just three years ago, there were scarcely 30 farmers using pumps and sprinklers in dry weather—and those mostly truck growers.

Although you can buy a small pump and pipe layout for two or three acres for as little as $500 or $600, Davis believes that the average system in the state these days represents an investment of about $1000—or some $75 to $100 per acre irrigated. A generous figure on yearly operating costs would be $20 to $25 an acre, he thinks.

At least a half-dozen Georgia dairymen are using their pipe and sprinklers on pastures. One of them, J. P. Dyar, of Greene County, gave his grass four applications of two inches each during a two-month dry spell last fall. He says that each acre of irrigated pasture gave him 35 to 60 pounds more milk a day than those he didn't irrigate.

In Fulton County, R. K. Whittier tried irrigating a 40-acre cornfield last year. But he wasn't satisfied with water alone so he hooked up several barrels of liquid nitrogen to his pump and sent fertilizer and river water, both, through his pipe. He used 200 pounds of liquid nitrogen to the acre—or the equivalent of 400 pounds of 16 per cent nitrate of soda, and was very happy with the results. His corn made 60 bushels an acre.

Many Georgia growers are irrigating their tobacco beds, but John Deen, of Coffee County, is

one of the first to try it on his fields also. He paid for his pipe and pumper in one year with about two good water applications. The water gave him from 400 to 500 pounds more flue-cured tobacco an acre. He says the quality held up, too, in the irrigated section but thinks a man could give the tobacco too much water.

Two or three truck farmers near Marietta, Georgia, weren't sure that they would need a water rig each and every year nor did they feel that any one of them could stand the expense of buying a pumper and pipe and having it sit in the shed so much of the time waiting for a dry spell. So they decided to save money by going together on the proposition. They bought an extra large pumper and enough pipe to leave a little on each farm. With the large pump they can put on water fast enough in dry spells so that the pump and a certain amount of pipe can be shifted from one farm to another in plenty of time to keep their crops from wilting.

At the Georgia College of Agriculture, in Athens, John Carreker and Jack Liddell of the Soil Conservation Service not only have been checking Georgia's catch-as-catch-can weather to find out when and where irrigation is needed but they have been putting their findings into practice for over two years on fields lying beside the Oconee River. They use a little pump mounted on a 4-wheel surplus bomb trailer. It will put out 250 gallons a minute at 60 pounds pressure and costs only $180. Sprinklers and pipe fittings cost another $100, and some 500 or so feet of three- and four-inch steel pipe ran their costs to something over $600. Of course they are favorably situated to irrigate.

Liddell estimated that it cost them $3 to $5 each time they irrigated an acre of pasture last year, and since it was dry, they gave the grass six 2-inch shots of water from May through September. For the whole grazing season, the irrigated pastures carried more than twice as many dairy animals as the nonirrigated pasture just across the fence. Weight gains almost doubled on the watered fields too.

At the Middle Tennessee Experiment Station at Columbia, John Ewing and C. E. Wylie have some irrigation information that might interest the average dairy farmer too. They had an average of nearly 26 inches of rainfall a summer during 1945 and 1946 but boosted the heavens' bounty with some nine inches of man-made rain each season. It paid in milk, body weight, and everything else. The average return above all costs each year (including irrigation costs) averaged $188 an acre for the irrigated

pasture. Pasture not irrigated averaged $162 above cost.

A Bradley County, Tennessee, farmer named S. N. Varnell heard about this work and bought an Army surplus fire-fighting pump and motor, plus enough light pipe and fittings to water 2½ acres at a time. The outfit can put on more than an inch of water in less than three hours, using about 15 gallons of gasoline, and it paid for itself the first year, he says.

Varnell irrigated 26 acres of corn last summer and got a yield of 60 bushels an acre—more than twice the yield of nonirrigated corn planted on the same kind of soil. Irrigating also gave him an extra month of grazing on 20 acres of pasture. On 13 acres of alfalfa it gave him the equal of a fourth cutting.

Probably the most interesting of all the experiments with the new, traveling irrigation rigs was rained out in Western New York last year. Farmers in Allegany County had laid plans for their soil-conservation district to operate two pumpers and several truck-loads of pipe on a rain-by-telephone basis at $2.50 to $7 per acre inch of water. But the pipe didn't come in time and the rains did—in a nice, three-inch-a-month gentle "drizzle-drazzle" that soaked into the soil and pretty well kept the corn from firing and the grass from turning brown.

So, instead of rain by telephone, they contented themselves with a half-dozen scattered demonstrations of what pond water, pumps and sprinklers could do on a few fields that didn't get quite their share of rain. The results on strawberries, potatoes, corn and pasture were so good that three of the men who watched them went out and bought pipe and pumps of their own.

Allegany County farmers, like those in Georgia, South Carolina and the other states where portable irrigation is rapidly gaining favor, are frank to admit that they don't know exactly when to irrigate, or how much. John Lamb, head of soil-conservation research in New York and a man who probably knows as much about ponds and portable irrigation as anyone else in the state, uses a scientific gadget called a tensiometer for this purpose at the Arnot Experiment station where he carries on some of his studies.

Figuring the moisture-storage capacity of his soils at four inches —the same as that for most of Allegany County a hundred miles to the west—he waits until the tensiometer shows less than an inch of useful moisture moving around in the soil and then hauls out his pump and pipe to put an inch or so of water on the field. That still leaves room for an inch or so more in case the weather-

man gets nasty and comes along with a cloudbuster just after he has wheeled the rig back into the shed.

In ten years of tests at the Arnot research station and elsewhere, Lamb has found that ordinary late-maturing field crops can use 2 to 12 inches of moisture more than the 36 inches the heavens supply in a normal year. He thinks corn needs six to eight inches of rain during August alone for best growth; yet most of it in New York State gets no more than three inches.

Sometimes, he says, water may delay a crop like tomatoes from maturing, even though it increases yields. And water applied at the wrong time may "burn out" corn. In South Carolina, McLeod, the custom rainmaker, likes to put up to half an inch of water on strawberries after each picking, if it's dry. For peaches, he and H. Z. Duffie, Clemson College irrigation engineer, think that 1½ to 2 inches is needed in ordinary years for the sandy sections.

Joe Douthit, South Carolina farmer and soil-conservation leader, puts water on his sweet corn every week and a half if dry weather comes in the "shooting" period just before it silks. In many places there is a rule of thumb that calls for irrigation water if the soil is so dry it won't hold together but just runs through your fingers when you squeeze it. The main idea is to apply water before plants show any sign of wilt.

Walter Miller, of Williamstown, New York, has been irrigating the light soils of his farm near the Adirondack mountains for ten years. Using portable pipe and pumpers of his own design, plus ponds he scoops out with a rented bulldozer or power shovel, he gets as much as a hundred bushels of potatoes extra an acre when he puts water on at the right time. If the rain gauge on his farm drops below 1½ inches for the week (in hot weather), he begins to think about irrigation. Then, if he gets two dry days in a row, he irrigates. Otherwise, he'd always be in debt to the fertilizer man, he says.

Besides the arguments about how to apply water, there are also differences of opinion about what pipe to use and how much to pay for a pump. The pipe comes in 2-inch to 8-inch sizes. And there are couplings almost as easy to fit together as smacking your fist into the palm of your hand. Some of them will bend around a 15 degree angle, just in case your land isn't level. There are ordinary-sized sprinkler nozzles that will throw water 80 feet and big ones, half as tall as a man, that will cover a 400-foot circle. The latter have been used in

Georgia peach orchards for above-tree sprinkling and can cover 300 trees at a lick.

Some men prefer 18-gauge steel pipe that will stand 200 pounds pressure and may weigh some 80-odd pounds per 20-foot section. Others like the aluminum pipe which weighs only a third as much. The aluminum pipe is strong—you can drive an auto over it when there's a little water running through it. But some men say the steel is best because it stands rougher handling without a dent.

Honey Hunting

Condensed from American Forests

Harry Botsford

If you are allergic to violent exercise, if you seek a quiet, leisurely outdoor rural sport which has the spice of adventure in it, may I suggest that you try honey hunting. Equipped with a cigar box, a bit of flour, and a drop or two of syrup, all you need do to enjoy this leisurely sport is go out in an open field and watch for a feeding bee.

Regardless of where you live, if there are trees in the area, you can almost rest assured that you will find good hunting. You won't have to worry about a lack of honey bees—there are millions of them and each year thousands of domestic swarms escape and take up residence in suitable hollow trees.

Further, your entire hunting equipment will cost only a few cents. No special clothing is required. What is needed is patience, sharp eyes, such minor items as a tablespoon of white flour, a little box you can make yourself, a trifle of sugar syrup and a lot of rural area in which to pursue your sport.

The wooden box should be rectangular, say about five inches long, from two to three inches deep and from three to five inches wide. Let the box have a sliding top, equipped with a small piece of glass as a window. A handy man can make a suitable box in a half hour. If you're not a handy man, cut a hole in the lid of an empty cigar box, then use scotch

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tape to fasten a piece of window pane over the hole. If you're not handy enough to do this, you'd better forget about honey hunting.

Now for the finishing touch. Take the cap of a bottle and fasten it to the bottom of the box. Into this pour a few drops of syrup. Then put a tablespoon of flour in an empty pepper shaker and slip it in your pocket—and you are ready for adventure!

Any time of the day will do. Any time of the year, when it's warm enough for bees to fly or for flowers to bloom, is suitable for the hunt.

Go out into an open field and watch for a feeding bee. You'll find one wherever there's clover or flowers. As the honey bee is busily engaged in his work of gathering honey, gently bend the blossom over the open box and snap down the lid. You have captured your first bee, taken the initial step that may lead you to a rich bee tree.

If you watch through the glass window of the box, you will note that the bee is displeased about what happened to him. He will fly around and bat his head against the glass in an effort to escape. But the honey bee's no fool. He will soon calm down and start to examine his prison. He is, by nature, an industrious creature and he doesn't care to waste time. Eventually he discovers the syrup. Cafeteria, *de luxe!* Riches, a table laden with the prime ingredient for feasting, with enough left over to take home. He forthwith starts to load up. While he is doing this, gently slide back the cover. He won't leave until he carries a pay load. Dust him very lightly with the flour.

When he takes off for home, you'll see one of the reasons for the delicate dusting with flour. He will rise, circle once or twice and then fly directly toward his home hive or tree. It's very necessary that you note the precise direction in which he flies. The touch of white on his body gives him visibility that he normally lacks. If you happen to have a good pair of field glasses, they will help you to "line" the bee.

Leave the cover of the box open and wait patiently. Presently the bee returns for another free helping of your bounty. How do you know it's the same bee? You know because some flour adheres to his body.

While he is loading up for another voyage, close the lid of the box quietly and move 100 yards or so to the right or left angle of the direction of his first flight, which you must always keep clearly in mind.

Open the box. On his second flight he will circle several times to get his bearings. Then, a beeline homeward. Now is the time

for you to do a little job of computing the exact spot where the two lines of flight converge. Once you have established that point, the hunt is getting warm and the excitement mounts.

When your friend returns—and he will—move up to the point of convergence before you release him. You may travel a mile or two miles across country before you have repeated the performance enough times to enable you to decide that the bee is flying to a determined place. At long last, the slow and leisurely hunt reaches a climax. It may end at the hives on a farm. Which means you will have to start off again. This can and will happen. It's inevitable—but you shouldn't be discouraged.

Eventually, you will be in good luck and there will be a crossing of the "lines" in the woods. Then and there you will know there's a bee tree in your future and it's your job to locate it.

Laws regarding ownership of bee trees are peculiar in some states. You own the honey by right of discovery. The farmer owns the tree. A strict interpretation of the law is that you can't get at your honey without destroying his property. The reverse is also true. To cut down the tree and to salvage the honey requires joint and friendly agreement between the finder and the farmer.

The practical thing to do is to approach the owner of the land and tell him frankly that you have discovered a bee tree on his premises. Suggest that you jointly and equally share the honey. In almost every instance, you'll find the owner friendly and cooperative.

Not until cool weather sets in, usually in mid-October, is the time ripe to cut down your tree. By this time the bees have laid in a winter's supply of prime wild honey.

A dark night is ideal. You'll need a cross-cut saw, an ax, flashlights, some wood chisels, long knives and spoons and ladles. You'd better buy a small beekeeper's "smoker," a little device that generates clouds of sulphur smoke. Don't forget to bring along a wash boiler, dish pans and other containers for the honey.

The tree is felled in a fever of excitement. The snout of the "smoker" is inserted in the entrance used by the bees and pumped vigorously, filling the cavity with smoke, deadening the bees. Now the cross-cut saw is again used, sawing the hollow section of the tree partially in half. Two cuts, if you please, about two feet apart. The ax is used, together with the wood chisels, to split out a vertical section of the tree—and there's your wild honey, a veritable wealth of it, if you're lucky. Also, a lot of bees who will be very resentful if the smoke has not put them to sleep. They can

and will sting with vigor. A brimmed-hat, with a veil of mosquito netting provides excellent protection for the face—gloves for the hands, of course.

A large knife and big spoons or ladles are used to cut the honey comb and transfer it to the waiting containers. Wild honey dosen't come in neat little wooden frames as does the domestic honey you buy at the grocers. It is in long, bulky sections, the salvaging of which is a slightly messy job.

How much wild honey can you expect? That's difficult to estimate—it depends on the time of year that your swarm of bees took up residence in the hollow tree, on the size of the swarm, the lushness of the feeding area. It may range from forty to 300 pounds.

Most of the honey will have to be strained. For this, large cheese cloth bags, hung in a warm place, are used.

Wild honey is blessed with a distinctive flavor. It is a mixture of the dark and blond honeys, of buckwheat and clover and other flowers. It's something you can't buy at a grocery store; it would command a premium, if it were available. On hot biscuits or pancakes, wild honey is a sweet that a gourmet will enjoy. In cookery, wild honey gives pastry a flavor and a succulence that make it a prime favorite. Used on a baked ham, it reaches the acme of utility.

Honey hunting is great fun. Admittedly a lazy man's sport, it can help to while away a congenial summer. Once, recovering from a major operation, and denied the pleasure of fishing and golf, I turned to honey hunting. The gentle exercise was just what I needed. If I tired, I simply sat in the sun and read a book. Two months of being outdoors built me up physically, gave me a robust appetite, made me well again. True, I found only one bee tree, but I had a lot of fun doing it.

Don't go honey hunting in the optimistic expectation of finding a lush bee tree every day. You may not even locate one in a month. But, as you progress and attain skill in "lining" bees, you will find the sport to be absorbing, completely fascinating.

When you find a tree and salvage your honey, share it with your friends. It's a gift that can't be duplicated, and it's one that will be fully appreciated. And don't forget the wax that remains after the honey has been extracted. It has a pretty high market value.

If you approach honey hunting in the right spirit, you'll like it. It's a sport that you can play alone, or with a companion. It's a sport where you make your own rules. The rewards are many—and pleasant.

Making Newsprint from Wheat Straw

Condensed from Chemurgic Digest

AN EVENT that may prove to be one of the greatest achievements in the history of chemurgy occurred recently when newsprint paper was manufactured for the first time in a commercial mill with wheat straw as its entire basic raw material.

The implications of this event may be appreciated by reference to the fact that in the United States alone the production of paper is about 21,000,000 tons annually. Most of this at present is made from wood pulp.

Many high grades of paper cannot be made from wood pulp, and some cannot be made from straw. It is possible, however, that nearly half of the total paper output, including newsprint, wrapping grades, construction sheets container board, boxboard, and paperboard, could eventually be made entirely or almost entirely from straw.

In making newsprint from straw, about two tons of the raw material are required to yield one ton of the finished product. Hence, the potential market for straw in making American paper products may—in the not distant future—run as high as 20,000,000 tons annually.

Although mixtures of straw and wood have been used before in the manufacture of newsprint, notably in experiments of the Northern Regional Research Laboratory, the first full scale production of newsprint entirely from straw follows a process developed by the Kinsley Chemical Company of Cleveland, Ohio. President of this company is H. Lee Kinsley. Technical Director of the company and the developer of the all-straw process is E. R. Timlowski. The all-straw newsprint was produced on Sept. 7, in the plant of Chemical Paper Manufacturing Co., Holyoke, Mass.

As the paper-making machinery used in this trial run was designed only for using non-straw materials, the resulting product in the all-straw run was not as perfect as the developers of the process anticipate achieving in the near future when, they expect they will be able to use a mill re-designed especially for this purpose.

Yet the product was so good that it left no doubt in the minds of Mr. Kinsley and Mr. Timlows-

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ki that all-straw newsprint will be able easily to compete with wood-pulp stock as soon as the farm residue variety can be produced on suitable equipment.

A sample of the newsprint made in the trial run, shows that despite the handicap of having been produced on incompletely adapted equipment, the all-straw product is equal to wood-pulp newsprint in some ways, superior in some, and inferior only in respects that presumably will be remedied later and which—for some purposes—would not be a handicap even if uncorrected.

The all-straw sample is slightly more bulky than wood-pulp newsprint—which is not necessarily either an advantage or a disadvantage. It is somewhat tougher—more resistant to tearing—than the conventional product. Only in respect to its color was the sample inferior to present grades of newsprint. As the straw pulp received only a one-stage bleaching in the trial run, instead of a two-stage decoloring that is provided in the Kinsley regular process, the sample retained a very light tint of straw color. Also affecting its color is the presence of an excessive number of shives which remained in the pulp as a result of another mill variation from the standard Kinsley process. Both of these objections will be overcome easily, the developers assert, when all stages of manufacture conform to the technique they describe.

Of further importance, the straw pulp performed satisfactorily in the manufacturing process itself, going through the paper machine at a speed of 600 feet per minute.

While the improvements in the appearance of the all-straw newsprint will add considerably to its popularity for printing purposes, it presumably already is qualified for a wide field of other uses in which strength, more than appearance, is a decisive factor. Also, of immense importance to all-straw stock as a new competitor in the paper field is its low production cost. According to Mr. Kinsley, the wheat-straw product can be marketed at $65 to $72 per ton, which compares with a current price of $100 a ton or more for wood-pulp newsprint.

Last, but not least, in favor of the wheat straw paper is the practically unlimited supply of raw materials for it—in contrast to diminishing sources of wood-pulp.

So vast has been the increase in per capita consumption of paper in America in the last generation that the production capacity of the mills has been inadequate to meet the demand, and this has put a similar strain on forest resources. This situation has produced natural economic forces

(higher prices for wood) which has encouraged increased growing of trees and more efficient utilization of the forest crops. But even so, the still increasing demand for paper and paper products creates a serious need for a new source of raw materials as a major supplement to wood—and this is the immense field of opportunity now being developed for wheat straw and possibly for a number of other farm residues also.

The Path to Profit Is Grass Covered

Condensed from Eastern States Cooperator

Prof. Claude Eby
N. J. Agricultural Experiment Station

LIVESTOCK farming in the Northeast, to me means grassland farming. To supply our cattle with sufficient good quality hay, silage and pasture through the use of lime, manure and fertilizer—plus good management— should form the basis of a successful livestock industry of the future.

The dairy cow and the beef animal were designed by nature to consume roughage crops. The process of economical production, reproduction, long life and good health in cattle is traceable directly back to the soil through the crops produced on it.

Seventy percent of the total nutrient requirements of a well-bred herd of dairy cattle should be derived from roughage crops, grazing, hay and silage.

New Jersey's comparative studies in 1937–1938 indicated it cost $6.57 to place a ton of corn in the silo, and $4.71 to ensile a ton of a grass-legume mixture.

Another study covered the four-year period 1938–1941 with Holstein cows on well fertilized pastures compared to an equal number on full barn feed for an average of 150 days. The FEED cost of producing 100 pounds of four percent milk on pasture supplemented with some barn feed was 70 cents. One hundred pounds of milk from the barn-fed group cost $1.24 for FEED. These animals were high producers, averaging 12,000 pounds of 3.7 per-

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cent milk, twice-a-day milking. The pastures produced 1904 pounds of TDN per acre, yielding 2836 pounds of four percent fat-corrected milk with a net return for pasture of $52.47 per acre.

In the Northeast, we are going to continue to pasture cows and other livestock on much of our present permanent pastureland. There is little other use for it except to grow trees, but a lot of it can be made to produce worthwhile pasture. A topdressing of lime and fertilizer greatly increases the carrying capacity and also improves the quality of the feed. And with the establishment of higher fertility levels, many weeds and low value grasses give way to blue grass and white clover.

A good pasture program is one that provides all of the green grass that stock can eat from the time they are turned out in the spring until stabled in the fall. This may be an ideal that is seldom completely achieved, but it is certainly worth making a reasonable effort to attain.

In 1931, one of our New Jersey Experiment Station farms would not carry one cow on five acres. At the end of the 1934 season, the records show the carrying capacity had been increased to 1.36 heifers per acre with a live weight gain of 1.2 pounds per day, for a pasture season of 141 days.

At the end of 15 years when results were summarized, we found this formerly poor area had carried on the average during this time 65 head of dairy heifers on 46 acres for an average of 126 days of grazing with a carrying capacity of 1.4 heifers per acre. The average yearly gain per animal was 152 pounds at a cost for fertilizer, lime, dragging, and clipping, of 2.7 cents per pound gain.

The average cost of these operations was $6.02 per acre. After the initial application of lime, three other applications were made during the period to maintain the pH at between 6.4 and 6.6.

In order to produce as much grass as possible and not have it all ready for grazing at one time, the plan of fertilization followed was this: 500 pounds per acre of 10–10–10 on part of the fields, 500 pounds per acre of 5–10–10 on several more and 500 pounds per acre of 0–10–10 on the remaining fields. All applications were made in late March. By this means of controlling the amount of nitrogen supplied in the fertilizer, we have been able to control to some extent early spring growth. Six to eight heifers per acre are turned in a pasture for the first grazing.

One of the fields in this area was set aside in 1935 for the annual application of a 2–1–1 fertilizer mixture. We wanted to know two things. First, is such a

mixture economical and, second, would 100 pounds of nitrogen drive out white clover? We were told it would, but we did not believe this to be true if sufficient basic elements were supplied.

In 1931, not enough white clover was present to record it on this field. In 1933, five percent white clover was counted; in 1938, 38 percent, and in 1945, 41 percent. Medium to close grazing was practiced during the entire period and the animals rotated. By 1942, Canada blue grass and redtop had entirely disappeared and the weed population was down to six percent. The pasture was clipped for an average of 2.5 times yearly during the period, and dragged each fall with a pasture-type harrow.

The field's carrying capacity was 8.5 heifers on the 4.4 acres for an average of 121 days of grazing over the 10-year period. This averaged 1.9 heifers per acre at a cost of 5.4 cents a pound gain. The heifers gained 181 pounds for the grazing season.

The amount spent per acre for fertilizer, clipping and dragging was $18.94.

Fertilizer was applied at the rate of 500 pounds per acre of a 10–10–10 mixture in late March and an additional 200 pounds of calcium cyanamid after the second grazing, usually in early June.

Out of these pasture studies came two very important observations. In the first place, a grazing season of 121 or 126 days, is not of sufficient length and, in the second place, blue grass-white clover is of little value in dry seasons for grazing animals.

To obtain more forage and more cow days per acre, the next step in the pasture program was seeding some of the pastures to tall growing grasses and legumes. The average of four years' results of an orchard-ladino mixture yielded 5885 pounds of dry matter per acre. Brome and alfalfa 5840; reed canary-ladino 5400; ladino seeded on blue grass sod 4022; brome-ladino 3943 in comparison with blue grass-white clover of 3231. All seedings were fertilized with 500 pounds of 5–10–10 per acre annually.

The first seeding of ladino clover in New Jersey was made in 1937. To determine the needs of the ladino plant for potash, four plots were laid out in 1940, receiving annual applications of 0, 50, 100 and 200 pounds of K_2O per acre; all four plots receive annual applications of 50 pounds P_2O_5. Milking cows were used as the grazing animals. Dry matter yields were determined from green samples taken before the cows were turned into the pasture. In 1945, these plots yielded respectively, 1979, 6129, 8569, and 8486 pounds dry matter per acre. The

percentage of ladino clover in each plot was 31, 45, 48 and 63.

Manure-treated plots at rates from zero to 10 tons per acre showed a definite advantage in the five-ton application, both from the standpoint of yield, percentage of ladino clover and palatability.

Where soils are stony and difficult to plow, it is possible to introduce ladino clover in an old pasture sward without plowing or discing by grazing the area closely the preceding fall and broadcasting ladino with a breast seeder in late March while the ground is still honey-combed. This method works very well for us on stony, hard pan, and low lying areas. We found germination more effective when we covered the broadcasted seed with a light application of manure. At the end of five years on an old established blue grass sod, a 56 percent stand of ladino and native white clover was present by this method.

In some favorable years, we have produced as much as 27 tons of green weight per acre, and 20 tons per acre is a common occurrence in Sussex county, New Jersey. Professor Bender likes to make the following comparison: a 100 bushel yield of corn per acre will furnish 537 pounds of protein and 4480 pounds of nutrients, and the corn has to be husked, shelled, and ground for the cattle. A 20-ton yield of pasture will furnish 1800 pounds of protein and 6000 pounds of nutrients which the cattle harvest themselves.

Surplus pasture should go into the silo. Mixtures of brome and alfalfa, brome and ladino, orchard and ladino, make excellent feed for both milking cows and their heifers when put in the silo. For many years now, our heifers from one year old to freshening receive only good grass silage at the rate of six pounds for each hundredweight of live animal; hay at the rate of two pounds a day for each animal in winter and fertilized pasture in summer.

Good hay—leafy, green, free of mustiness and mold is the aim of a good dairy farmer. With modern equipment such as pickup balers, forage harvesters, improved side delivery rakes, mow-curing devices with and without supplemental heat are all designed for improving the quality of hay.

Good leafy, well-cured hay fed to milking cows will save the dairyman about three pounds of grain per head daily over poor quality hay. For a 180-day winter feeding period, this represents a saving of $1500 for a herd of 50 cows.

Alfalfa without question is the most valuable plant in the manufacture of milk, and in the Northeast probably the most difficult to grow. It may winter kill or heave

out in the spring. It is subject to bacterial wilt, to attacks from leaf hopper, from leaf spot, and black stem. Time of cutting may have an adverse effect on the length of life of the crop and on the yields. Its fertilizer and lime requirements must be met, and the soil structure must be just right. We have run into all of these problems; we have wet spots in our fields, soils of a cobbly nature which are difficult to plow, where we have used 800 pounds of 0–20–20 annually and plowed under tons of finely-ground limestone and in other cases coarse limestone. We have used improved varieties, seeded in the spring and seeded in August, but the fact remains, the alfalfa disappears in two to three years.

To offset these difficulties, we seed alfalfa and brome on those fields known to be adapted to the alfalfa plant. On other low lying, but not wet fields, brome and ladino clover, on the wet fields or fields with numerous wet spots and hard pan, reed canary and ladino clover is finding a place.

To handle reed canary grass the forage harvester is almost a must, with the first cutting going into the silo. The second cutting is leafy and palatable and makes an excellent hay. Our bull herd of 30 animals seems to prefer reed hay to timothy. We keep our reed fields at pH 6 and fertilize with 500 pounds per acre of a 5–10–10 mixture as long as ladino is present. After the disappearance of ladino, reed canary then receives 500 pounds per acre of 10–10–10. This practice is also followed with bromegrass. We note that stock like nitrogen-fertilized reed both as pasture and hay, better than grass from unfertilized areas.

For the present, we have eliminated corn entirely from our crops program and will use sudan grass and soybeans when it is necessary to plow. We can't afford to grow corn on our soil types. Our records show we have been producing a ton of hay more per acre during the last five years than we did the previous five years. In 1931, 90 acres of corn were grown on the farms; this year, no corn. But we are producing bromegrass with a three- to four-foot root system yielding up to four tons of 20 percent moisture hay per acre, and up to 3.5 tons of reed canary grass hay, which is entirely free from weeds, eight years after it was seeded.

Weeping Lovegrass Stills Vermont's Sandblows

Condensed from Better Crops With Plant Food

Kathleen B. Webb
University of Vermont

WEEPING lovegrass plus fertilizer spell doom to Vermont's little Sahara Deserts —2,800 acres of active sandblows. This hardy grass when adequately fertilized stills the blowing sand so that locust and pines can be successfully established to provide a permanent ground cover.

Joseph B. Kelly, A. R. Midgley, and K. E. Varney, agronomists at the Vermont Agricultural Experiment Station, tested 22 different grasses and legumes before finding one that could withstand the adverse conditions in sandblows and one that did not require a great amount of expense and labor to plant.

Vermont's sandblows are extremely sterile and devoid of plant nutrients. Not only are they useless in their present condition and eyesores on any farm, but they are constantly growing and damaging other land. About 6,000 acres of Vermont farmland are subject to this type of wind erosion. On large areas in the Green Mountain State the soils are derived from water-deposited sands of glacial origin. They are naturally droughty and low in fertility. Such land should never have been cleared of trees in the first place, for without fertilization, these soils, once cleared, quickly lost their vegetative cover. The organic matter was literally burned out, and then the plant-food elements, especially nitrogen and potash, were leached out. Overgrazing, excavations, field roads, cow trails, and gullies were sufficient to begin a sandblow. Once started, sandblasting constantly enlarges the area, killing plants in its path.

To meet this problem, Agronomists Kelly, Midgley, and Varney sought a practical and economical procedure for revegetation. Weeping lovegrass gave them the answer. At current prices, $12 to $15 will buy sufficient seed and fertilizer to stabilize an acre.

Of the 22 grasses they tested, all but five grew poorly and after the first year disappeared completely. The five promising grasses were: weeping lovegrass (*Eragros-*

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tis curvula), false cheegrass (*Calomogrostis epigiose*), sea lyme (*Elymus arenarius*), beach grass (*Ammophila breviligulata*), and American dunegrass (*Elymus vancouverensis*). These grasses grew well and produced an abundance of vegetative cover, particularly when high rates of fertilizer were used. However, all of them but lovegrass had to be planted from root-stocks.

Weeping lovegrass, on the other hand, may be seeded much as any ordinary grass or legume. It is a rapid, vigorous-growing perennial bunch grass which produces a quick, stabilizing soil cover. It has an unusually extensive root system consisting of many deeply penetrating roots of about the same size throughout. This thick mat of roots helps to hold the sand in place. More than moisture, these roots require fertilizer. The deep roots can obtain sufficient moisture from the sand to support a luxuriant growth but they must have the minerals, particularly nitrogen, that are lacking on sandy soils.

The first step in the revegetation procedure recommended by the Vermont agronomists is to fence the sandblow area to prevent cattle from grazing it. Then as soon as the frost is out of the ground in the spring, the next step is to lay the area out in alternate 12-foot grass-locust strips and 24-foot pine strips. These strips should be at right angles to the prevailing winds, with the first strip in grass-locust.

Apply fertilizer to the grass-locust strips, the agronomists say, at the rate of half a ton of ground limestone and 1,000 pounds of 5–10–10 per acre. Broadcast weeping lovegrass seed, at the rate of 3 pounds per acre, on these areas and rake the lime, fertilizer, and seed into the surface in one operation. As the grass-locust strips occupy but one-third of the total area, only four bags of limestone, three bags of a 5–10–10 fertilizer, and one pound of weeping lovegrass seed would be needed to stabilize an acre. The grass must be seeded early so that it can become established before the surface of the sandblow dries out.

The next step is to plant black locust trees (rooted nursery stock) at 6-foot intervals in two staggered rows in the grass strips. A small handful of 0–20–20 fertilizer should be put in the bottom of each hole. To promote more rapid growth the black locust may be fertilized annually at this rate for four or five years. For this annual fertilization, broadcast about the base of the trees, extending out to the ends of the outer limbs.

Early the second spring, or sometime the fall after planting the lovegrass, plant red pine (also rooted nursery stock) in the 24-

foot space between the grass-locust strips, using a 6-foot spacing in four staggered rows. Fertilizer should not be used with the pine as it would do little good and would be apt to harm the young trees. Unlike black locust, pines do not respond to fertilizer. The weeping lovegrass will have stabilized the blowing sand, and by the second year much reseeding frequently occurs. Although it frequently winter-kills, the lovegrass produces a dry mulch that makes an excellent ground cover, for it decomposes very slowly, both roots and top growth.

The black locust (*Robinia pseudoacacia*) is a legume tree with a strong, spreading root system that feeds heavily on subsoil minerals. Each fall it drops its leaves and leaf stems, forming a mat on the soil surface. Kelly, Midgley, and Varney analyzed the leaf mold deposited beneath a 9-year-old stand of black locust and found it amounted to 4½ tons per acre.

The nitrogen returned to the soil by 4.5 tons of black leaf mold is equal to 1,000 pounds of nitrate of soda per acre. The potash content is equivalent to 13 pounds of 50 per cent muriate of potash, phosphorus equivalent to 100 pounds of superphosphate, and lime equivalent to 280 pounds of ground limestone. Thus the black locust plays a big part in rebuilding the fertility of the soil at the same time that it makes a short-time tree crop.

The red pine (*Pinus resinosa*) is less susceptible to insect and disease damage than other pines and is also a valuable species for lumber purposes. It affords a long-time cover that has a future value as marketable timber.

Thus with this method of using weeping lovegrass, fertilizer, black locust, and red pine, revegetation of Vermont's sandblows becomes a practical undertaking. Vermont's farmers can reclaim lost land and halt the destruction caused by the stinging particles of sand in 2,800 acres of Sahara Deserts.

Sheep Research Findings

Condensed from Sheep and Goat Raiser

J. F. Wilson
University of California

IN AN experiment in New Zealand large numbers of fleeces from purebred rams, purebred ewes, and their offspring were weighed and judged for character, hairiness and a number of other factors. Then the data were subjected, by the application of mathematics, to what is called an "analysis of variance." Through this analysis of variance it was shown that the parents of a lamb control only about 10 per cent of the variation in their offspring. The remaining 90 per cent is due to individuality of the animal and to season and environment.

This means of course that any breeder of purebreds may look at a new lot of yearlings and think he has the world by the tail, that they are far and away better than any previous lot. He is likely to give all the credit to the ram that sired them. Actually if the whole bunch could be subjected to an analysis of variance it might show that the improvement was there all right but had come about through an exceptionally good feed year or a new shepherd who took better care of them.

The same data permitted an analysis of the real improvement that had taken place after individuality and environment had been calculated out of the picture. They showed that, in the sheep measured, if the owners culled 50 per cent of their ewes each year keeping only the top half producing the heaviest fleeces, it would take 48 years to raise the average fleece weight one pound. If the same breeder kept all his ewes but culled 97 per cent of his rams, keeping only the 3 per cent that were the heaviest shearers, he could raise the average fleece weight a pound in 18 years instead of 48.

This experiment also showed that only a few offspring are necessary to test a ram's prepotency. From 7 to 15 are enough. If the breeder culls (meaning he sells off) 80 per cent of the rams he raises, keeps 20 per cent of his tops and tests them by breeding them so that he can keep track of their offspring, then selects his own

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studs on the basis of the performance of their offspring he might raise the average fleece weight in his flock one pound in about 2½ years after the progeny test is completed. He would do this by breeding the tested rams, the 3 per cent that were proved best, to as many ewes as possible. In their experiment they found that among 14 stud rams, one had offspring whose fleeces averaged nearly 11 pounds in weight, another's only 9.25 pounds. Actually every breeder who buys a new ram and then discards him is progeny testing. It is not new. Bakewell did it in England over 150 years ago and became the master breeder of the world in his time. Any sheep breeder with years of experience knows that when buying stud rams for his own use if he gets one really good one out of 10 he is rather fortunate. He also knows that very often the appearance of a sire is a poor measure of his prepotency. Yet 99 per cent of the stud sires used in America are bought solely on looks. We have made little improvement in the average fleece weight of our sheep in this country in the last 30 years. If we are to progress much further from now on it will undoubtedly be through adoption by stud breeders of some plan of progeny testing on a sounder and more scientific basis than we have been accustomed to. The New Zealand experiment is a good example of what may be done.

Another research report comes from South Africa where a study was made of the effect of diet and body condition on the heat regulating system of Merino sheep. They took 8 fat wethers and 8 thin ones in 2 different lots. The fat ones were fed corn and alfalfa, the thin ones grass hay of poor quality. After a month 4 fats were put in with 4 thins and vice versa. Then they were fed nearly another month. During all this time the temperatures of the sheep were taken twice a day. The temperature of air varied from 30 degrees to 70 degrees, which by our standards is not much of a variation but the findings were very significant. They showed that thin sheep do not have nearly so much control over their body temperatures as well-fed ones. When it got cold the thin sheep had a much lower body temperature than those in moderate flesh; when it got warm the thin ones had an excessive rise in temperature and their panting was suppressed. The investigators concluded: "In Merino sheep control of body temperature is the first of the vital functions to be impaired by under nourishment." Another conclusion was: "Food intake has a direct bearing on ability to maintain temperature during exposure to cold."

These problems are closely re-

lated to the problem of supplementary feeding of our sheep. Food is burned up in the animal body. Without an adequate supply of it the animal cannot withstand either heat or cold nearly so well as an animal in reasonably good condition. Certain species, such as the Brahma cattle, have a more efficient heat regulating system than other species of cattle. Some breeds of sheep like the Merino can stand heat better than other breeds like the Romney. But the South African experiment shows that within the breed the condition of the animal regulates to a large degree its capacity to withstand either heat or cold. We already know that a ewe in good flesh is more prolific, a heavier milker, a better mother and a heavier shearer than a thin ewe. She is also less subject to disease and to the effects of internal and external parasites. Very probably one of the main reasons she gets along so much better is because she is more comfortable. Her heat regulating system works more efficiently. The contented animal is the profitable one.

New Discoveries in Livestock Feeding

Condensed from the Hog Breeder

Dr. F. B. Morrison
Cornell University

DURING recent years decided increases in the efficiency of livestock production have been made possible in this country through the discoveries made by our agricultural experiment stations in livestock feeding and nutrition. Indeed, in no other country has so much new scientific information of direct value to farmers been gained through such research as in the United States.

Some of these discoveries are so recent that knowledge concerning them has not yet become general. Let us consider some of the new information concerning (1) quality or kind of protein; (2) minerals, including the so-called "trace" minerals; (3) vitamins; and (4) hormones.

It is well known that human beings, swine, and poultry must not only have in their food a sufficient amount of protein, but also must have protein of the proper

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kind or quality. To understand the importance of quality of protein in animal nutrition, it is necessary to have in mind certain facts about proteins.

All proteins are very complex substances, containing many thousands of atoms. They are made up of combinations of at least 23 relatively simple nitrogenous compounds, called amino acids. All of these amino acids are needed to form the proteins of the body tissues or to make milk or wool. Some of the amino acids can readily be made within the bodies of animals from other amino acids, or even from still other compounds.

On the other hand, investigations by Rose of the University of Illinois and by others have shown that certain of the amino acids cannot thus be made from other compounds, or else they cannot be made rapidly enough to meet all body needs. These amino acids must therefore be furnished by the food. They are hence called the essential amino acids.

In feeding the swine the quality or kind of protein in food is just as important as having the proper amount of protein. Unless a ration for pigs supplies plenty of the essential amino acids, the results will be unsatisfactory, even though there is a plentiful total amount of protein.

For example, pigs will make very poor growth on a ration of corn grain fed with such protein supplements as corn gluten meal or wheat middlings, even when all the necessary minerals and vitamins are furnished by special supplements.

One of the very important facts in livestock feeding is that all of the cereal grains have protein of rather poor quality, because there is an insufficient amount of one or more of the essential amino acids. Milk, skimmilk, and such feeds of animal origin as meat scraps, tankage, and fish meal have a high value for correcting the deficiencies of the protein in the cereal grains in feeding swine.

Many experiments have been conducted by the experiment stations during recent years to determine the extent to which animal-protein supplements, such as dairy by-products, meat scraps, tankage, or fish meal could be replaced by protein supplements of plant origin. These experiments have shown conclusively that soybean oil meal which has been well cooked in the manufacturing process is the best substitute for animal protein in feeding swine.

One-half or even more of the animal-protein supplements can readily be replaced by soybean oil meal, if care is taken to provide an ample supply of minerals and vitamins in the ration. Indeed, some investigators believe that soybean oil meal supplies

protein of just as good quality as meat scraps, tankage, or fish meal. However, soybean oil meal is low in calcium and only fair in phosphorous, while the animal-protein supplements are very rich in these minerals. A calcium and phosphorous supplement must therefore be added when soybean oil meal replaces a considerable part of the animal-protein supplements.

Also, soybean oil meal does not supply as large amounts of certain of the B-complex vitamins, including an unknown vitamin which has been called the "animal-protein factor." For this reason, the best results are generally secured when at least a certain amount of dairy by-products, meat scraps, tankage, or fish meal is included in rations for swine, unless they are on first-rate pasture.

The protein of peas supplements that of the cereal grains to a considerable extent, but not so completely as does the protein of soybean oil meal. This is because peas are low in methionine, the essential sulfur-containing amino acid. However, experiments by Washington State College and other institutions have shown that peas produce excellent results when fed as the only protein supplement to pigs on pasture.

In recent Washington experiments, ground peas were even satisfactory as the only protein supplement to a mixture of ground barley and wheat, fed with alfalfa meal and with a mineral mixture supplying calcium and phosphorus. However, in similar Idaho trials, there was a benefit from including a small proportion of meat meal or tankage in a ration of ground wheat and peas.

Recent investigations have given much additional information concerning the mineral requirements of farm animals. These experiments have shown the conditions under which mineral deficiencies are apt to occur with various classes of livestock and in different regions, and concerning effective ways of correcting such deficiencies.

It has long been known that it was wise to provide farm animals with plenty of common salt (sodium chloride). The only exceptions to a decided need for additional salt are: (1) in districts where the forage contains much more salt than usual, or (2) when tankage, meat scraps or fish meal, which contain considerable salt, are used as the only or the chief protein supplements in swine rations.

Recent experiments at Purdue and at the University of Wisconsin have given striking proof of the importance of providing salt for pigs fed grain and protein supplements of plant origin. For example, in Purdue experiments

pigs gained only 0.86 lb. per head daily and required 562 lbs. of feed per 100 lbs. gain when fed yellow corn, soybean oil meal, and a mineral mixture containing no salt. Other pigs supplied salt in addition gained 1.61 lbs. and needed only 3.63 lbs. of feed per 100 lbs. gain.

Investigations on the calcium requirements of livestock have shown that calcium supplements are commonly needed for swine. The feed of swine consists mostly of grain and grain by-products, and they eat relatively little forage. All grains and grain by-products are exceedingly low in calcium. On the other hand, legume hay, pasture, and other legume forages are very rich in calcium. Even non-legume forage is fair in calcium content, unless it is grown on soil very deficient in calcium.

Swine will usually have enough phosphorous when tankage, meat scraps, fish meal, or dairy by-products are used as the chief supplements to the cereal grains, or when the ration contains considerable wheat middlings. On the other hand, a mineral supplement supplying both calcium and phosphorus is needed when such a feed as soybean oil meal is used as the protein supplement. This is because soybean oil meal is not as rich as wheat middlings or linseed meal in phosphorus.

It is now well known that in areas where there is a deficiency of iodine, it is necessary to supply pregnant livestock with an iodine supplement to prevent goiter in the new-born young. The most convenient way of furnishing iodine is to use iodized salt in the place of common salt. In other areas, there is generally no benefit from feeding an iodine supplement to livestock.

It is also well known that serious anemia is frequently produced in suckling pigs when they are kept in confinement during the suckling period, unless some method is used to supply the traces of iron and copper they need for red-blood cell formation.

These trace minerals can be supplied by swabbing the udder of the sow once a day with a saturated solution of ordinary iron sulphate. Iron sulphate of the usual kind contains the necessary trace of copper also. A less certain method is to put in the pen some sods or dirt from a field not infected with swine parasites. The young pigs will usually, but not always, get the needed iron and copper in rooting over the sod or soil, pig fashion.

There is generally no benefit whatsoever in adding an iron or copper supplement to well-balanced rations for older swine.

Many important discoveries have been made during recent years concerning the importance of vitamins in animal nutrition and stock feeding.

Based on all of the vitamin investigations, we can first of all make the general sweeping statement that plenty of good pasture, combined with the exposure to sunlight when stock are on pasture, abundantly meet all the vitamin requirements of farm animals. To emphasize this important fact further, we can state that there is no deficiency whatsoever of any of the vitamins when livestock are on good pasture.

During the winter or when pasture is otherwise not available, well-cured legume hay or mixed hay high in legumes is the best substitute.

All farm animals require vitamin A and a serious deficiency causes disaster. Fortunately, all green, growing plants are rich in carotene, and animals can readily convert carotene into vitamin A in their bodies. Therefore, stock on green, actively growing pasture always have an abundance of vitamin A.

Also, animals that have a liberal supply of vitamin A can store considerable amounts in their bodies, especially in the liver. Hence, if they have been on good pasture during the growing season, this store helps meet their needs in winter.

In feeding swine which are not on pasture it is essential that good legume hay or some other carotene supplement be included in the ration. Legume hay of good quality is not only rich in carotene, but also is one of the best sources of the B-complex vitamins that will be mentioned later.

Farm animals need vitamin D in order to assimulate and use calcium and phosphorus. A deficiency of vitamin D causes rickets in young animals and similar trouble in mature animals.

Fortunately, exposure to sunlight provides animals with vitamin D. This is because the ultraviolet light in sunlight converts certain compounds, called sterols, into vitamin D in the skin and underlying tissues. For this reason, animals on pasture or otherwise exposed to a reasonable amount of sunlight secure sufficient vitamin D.

Winter sunlight provides less vitamin D effect than summer sunlight. This is because some of the ultraviolet rays are absorbed by passing through the greater amount of atmosphere in winter, when the rays of sunlight are very slanting. Nevertheless, in recent Minnesota experiments pigs suffering from rickets recovered to a marked degree when exposed to sunlight in winter for only 45 to 90 minutes a day.

A very important fact is that all field-cured hay and other field-cured forage supplies vitamin D. On the other hand, green growing forage has little or none. During the curing process, and only then, the ultraviolet light striking the

forage converts ergosterol in it into vitamin D.

Extensive investigations that we conducted at the University of Wisconsin and later at Cornell University have shown conclusively that even 5 per cent of good-quality field-cured alfalfa hay will supply sufficient vitamin D for pigs during our northern winters, if they have any reasonable exposure to sunlight. In spite of claims made to the contrary, there was no benefit from adding a special vitamin D supplement to such a ration.

Scientists have discovered a whole family of B-complex vitamins. Thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, choline, and folic acid have been definitely identified and their chemical structure determined. In addition, there are other B-complex vitamins concerning which much less is known.

Some of the B-complex vitamins are undoubtedly required by all animals, while others are needed only by certain species of animals. An exceedingly important fact, recently discovered, is that all of the B-complex vitamins are apparently made by the bacteria in the paunch, which are so important in the digestion of food by ruminants. Further on in the digestive tract, the ruminant digests the bacteria and therefore secures the vitamins made by the bacteria.

There is not much synthesis of B-complex vitamins in the digesitve tracts of swine. For this reason, it is important to supply an ample amount of these vitamins for swine not on pasture.

Several years ago we proved in investigations at the University of Wisconsin that it was highly important to include good-quality legume hay as vitamin insurance in the rations of pigs raised in dry lot without pasture, and also of brood sows in winter. Numerous recent experiments, especially experiments at the Illinois, Missouri and Wisconsin Stations have shown that when brood sows are kept continuously in dry lot, without any green feed, the results may be disastrous, even when they are fed rations that would be satisfactory if they had good pasture part of the year. The pigs are often born dead or they may die because of nutritive deficiencies before they reach weaning age.

These recent investigations have shown that such troubles can readily be prevented by providing good pasture during the growing season, and by including at least 10 to 15 per cent of good-quality legume hay in the rations of brood sows during winter. The legume hay is effective and cheap vitamin insurance. It not only provides plenty of carotene, but it also furnishes the known B-complex vitamins. In addition, it supplies other vitamins that are essential,

but which have not been identified thus far. This is shown by the fact that good legume hay is more effective than a combination of all the known B-complex vitamins when supplied in purified form.

Why Be A Friend of the Land?

Condensed from Land Letter

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DEMOCRACY was born among agricultural peoples. To the Pilgrims the rock bound eastern shores may not have seemed so friendly, certainly not during the first New England winter, but even those rugged shores and tidewater areas became more friendly with time and with the westward migration of those pioneers whose activities were almost wholly agricultural. What land wouldn't be considered friendly when once it began to supply food, clothing and shelter so generously?

It was the American pioneer, by this faith in himself and in the land, who championed and nurtured the spirit of democracy. In the soil and in the resourcefulness which he applied to it, the pioneer saw his freedom from oppression and security for himself and family. It was in his relation to the land by way of his own skills that belief and confidence in himself as part of the community were established. By his direct control of a piece of land he became an independent individual in struggle, in thought, and in fact. With his independence and his security in the open country as it stretched out before him it was a faith in Nature more than any faith in human nature that engendered what we call the real spirit of democracy.

Democracy as a political structure bespeaks independence for a group of people only when each individual constituting it has his own independence and thereby the group becomes independent.

If the stability of our democratic state has recently come under question it is possibly because we are becoming less and less agricultural. Instead of being highly agricultural, as were the pioneers, we are building our future securities in forms too far removed from

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the land. Perhaps with a larger majority of our people in the cities and with so many removed from close contact with nature in the open country they find their dependence on others greater than their own independence or their faith in themselves. As we urbanites find the possibility of providing our own food shut off by economic entanglements and interferences by others of the group, we think quickly of going back to the farm. When our independence as providers is trampled on by city congestion, the land again becomes a friend.

Can any group of folks in the city with its congestion, its complexities and the numerous dependencies forced on the individual, foster the independence and democracy which are fostered in the mind of him who wins his food and security directly by labor on the soil?

Faith in our democracy rose as we came westward. Our democratic independence became stalwart among other governments of the world as the deeper, blacker and more productive soils spelled greater security for each of us with a piece of land that could guarantee his own future. The development of our cornbelt carried our belief in democracy possibly to its zenith. Can we cease to be friends of the land when it perhaps more than we ourselves made for democracy?

Perhaps you have not felt the strong friendship of the land. Perhaps you have been too far removed from it and have been swept too far along in the emphasis, once placed on agriculture, now diverted to industry as the security of most of us. But when we use the machine to reduce labor to the minimum and when the creation of things that satisfy comes more and more by the activity of the machine and less and less of the person, can our minds retain their ingenuity and our hands their skills by which individual independence was established as the core of democracy?

Mass production has multiplied wealth and financial securities resting on human nature, but, unfortunately, it has been mining the resources resting in the land. There are signs of a quaking faith in the former and of a renewal of faith in the latter. We are coming to recognize that he who holds resources in the land sees the conditions of his security at closer range. Food shortages and declining food quality going with the eroded soils and dwindling soil fertility are rapidly bringing us again to be friends of the land.

Prosperity naturally encourages indifference and forgetfulness. While so many of us have turned away from the land to the point of almost forgetting its friendliness, it has become less friendly toward us. In building this nation

as our part in the westward movement over the world we in our ancestral migration from Europe forgot the fact that we also went south to a climate of higher temperatures. We moved from colder, more preserved soils to those rapidly depleted of humus when put under cultivation.

We forgot that transplanting agricultural practices from heavy clay soils to lighter silt loams is a movement from those demanding drainage and much spring plowing to those requiring much less of the latter. We forgot, too, that we moved from an area where rains are drizzles to the continental interior where they are drenchings. That agriculture must fit into the climatic forces and that these make the soils different as we select different regions was completely forgotten. Only now have we come to think what rainfall differences in Europe and the United States mean in terms of soil erosion.

Chamberlain's umbrella famed in caricature during prewar days of appeasement represents protection against the light showers in the maritime climate of northern Europe. An umbrella is not protection against the torrential downpours of our continental area of more open and more kindly soils. It has taken us a long time to realize that the "parasol"—protection against sun, as the French have it—was an European contrivance that serves to shed the showers there but one that is not —"parapleuie," as the French have it—protection against the rains, of gully-washing dimensions as we have them. We, too, accepted the umbrella as if it were appeasement when we should have recognized the propriety of the Sou'wester, the oil slicker and the gum boots.

It was our failure to recognize our shift to different climatic conditions and to soils of different nature as we moved ourselves from Europe to the United States. We brought our traditional European practices, more agreeable to the land there, and transplanted them over here. We now recognize many of these practices as less friendly to the land over here where they have proved themselves so exploitive that much of the soil has been washed away. Our lands remain as acreages, but their productivity is going and our security is dwindling with it. We are, however, reviving our own friendliness to the soil, and, fortunately, are turning to its conservation, late though the repentance may be.

Our financial depression that turned us to thinking more about prices and marketing than about production, and that served to push economics into umbral importance and agronomics out into penumbral significance, encouraged us to forget the soil as

the basic creator of wealth. We forgot, too, that much of what we call industry is mainly a magnifier of that wealth of agricultural origin. We forgot that economics follow after—and apply to—production, but do not precede or replace it. Land management requires more than an understanding of economics, which is a phase of human behavior. It calls for an appreciation of soils that are managed by an understanding of the sciences of nature and the forces directing growth and multiplication of plants and animals rather than by understanding human nature.

Our swing to economics and the many manipulated values led us to forget the land. We were pushed, not only in our individual experiences but even in our thoughts, farther from the soil and its creative power. Our hands were not reaching into the thrill of creation that fosters the spirit of humility and honesty and builds a distinct independence so common in the man who tills the soil.

Such changing attitudes, such attachments to other values, and divorcement from some considered too rural, bring congestion of peoples in the cities. They encourage amassing of monetary wealth but jeopardize security in terms of food the delivery of which from the greater distances hangs on thin and highly tangled threads. Such slight disturbances in human behaviors, as strikes, for example, may quickly bring serious entanglements in the food situation while the workings of Nature go nicely forward in regularity for ample production for all so long as the distribution is not disrupted.

Disturbances and decadence in our political order originate in the centers of human congestion and not out in open country where good political health is more prevalent. Increased urban populations that resulted in decreased rural populations have become a national threat of political decadence. They suggest a top-heavy superstructure on a shrinking foundation. This decadence takes its beginning in congested centers through which social infestations spread quickly and where irregularities in human behavior are readily incubated. Fortunately each post-war period reverses these tendencies and political health is partially restored by the movement of many families back to the land.

Friends of The Land are Needed on International Scale

While we may have forgotten the land in the past we have recently turned to increasing our friendliness toward it again. Through the Soil Conservation Service some sick land is given operative attention in the form of terraces as cures for erosion and

gully formation. We are farming around the hills on the contour and saving both water and soil for more food production. Some is put under curative rest from the plow, with grass cover to rebuild its strength in a renewed supply of organic matter. Some is given new nourishment in form of lime and fertilizers plowed under to feed the soil back to a higher state of fertility while plants, animals, and man, too, are fed better on it. We are repenting. We are apologizing for our neglect and are coming around to call the land our friend again.

This seeming reversal in sentiment toward the land with its soil as the producing power supporting agricultural production is not without some post-war international implications. Possessing significant land resources we find ourselves suddenly thrown into a political game of international dimensions being played for food as the stakes. To a costly degree we may find ourselves the postwar provisioner of much of the world, even as was true in the war struggle. Our land and its fertility resources as the security of our own future should be carefully inventoried at the outset and cautiously ventured in a game of such extensive ramification as the international peace problem suggests itself. Our democracy is being put to the test and its strength will in no small measure depend on how well we befriend our lands.

In this forthcoming international readjustment of many values, we must be friends of the land in every possible sense of the term. We must come to realize how limited in area is the land that really means nutrition for good health in terms of its soil fertility. We must realize, too, by what nations those land areas are possessed. Land must take on new values. It can no longer be considered a commodity which we can gamble, barter, squander, or lose. It must become the basic national food security in the conservation of which all share the responsibility whether land ownership is involved or not.

Our national strength, in the final analysis, lies in our soil and that strength in relation to future internationalism will be great only as all of us are friends of our land in the fullest meaning of those words.

Balance Your Soil Bank Account

Condensed from The Ohio Farmer

Earl W. McMunn

Is YOUR farm as good as it used to be? Are crop yields this year as high as they were 10, 20 or 50 years ago? What about the soil—is it easy to work or is it inclined to puddle become a cloddy mass after every heavy rain? What about those tile lines? Do they work as well as when they were laid years ago? All these things help answer that one basic question—how much do you have left in your soil bank account?

There's only one source for a farmer's wealth and that is the soil. True, he may get most of his income from a fine herd of dairy cattle or from feeding market hogs. He may be a poultryman or a beekeeper but still the answer is the same—the plants to support all animal life must come from the soil. And, if any kind of farming is long to be profitable the soil must be productive.

Here in Ohio we were blessed originally with some of the nation's most productive soil. In 11 counties of northwestern Ohio alone are two million acres of rich, level, productive soil. This soil is of the kind that has made the Corn Belt section of the United States the bread basket of the nation.

It's less than a century ago that most of this fertile western Ohio land was cleared. Many still living can remember cutting the great trees and getting the land ready for the plow. Much of that land was wet and needed drainage. Tile lines were laid and the rich, dark soil was ready for the plow.

Now, in less than a century, things are showing up which indicate that something has been happening to much of that land. Back when they were first installed tile lines could be laid five and even six rods apart and still give good service. Later they didn't seem to work so well and other lines were laid between, cutting the area to be drained by each line in half. Later on even the extra tile proved insufficient.

At the same time something else was happening to this land. Fields were getting harder to work. Plowing was more difficult and it was more of a job to get a field in good condition. There were more clods to break and it was more difficult to get a good seed bed.

What does all of this add up to? Well, it means just one thing—the organic matter present in this fer-

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tile soil was gradually disappearing. It was being used up faster than it was being replaced. The organic matter is what keeps land soft and spongy and with a high degree of ability to hold water. It's also the thing that keeps soil open and porous so that excess water can move through the soil and into tile lines. Without organic matter soil is tight and "puddles." In this kind of land tile lines are almost useless.

What's causing our organic matter to be used up faster than it is replaced? This is largely a matter of farming too high a percentage of our land in cultivated row crops. Too much of our land in corn and soybeans with too little in good sod crops is the answer!

It's true that these cultivated row crops have been profitable. That's the reason that our acreage in grain crops has gone up in the good farming sections of the state while the acreage in sod crops has gone down.

It was in the fertile Corn Belt section of the country that most of our wartime crop increase took place. In fact, half of all the increase in intertilled crops during the war years took place in the five Corn Belt states of Ohio, Indiana, Illinois, Missouri and Iowa. And it is fortunate that we had this great area of productive land, for it was only here that we had the good land that was necessary to get a big increase in crops and get it quickly.

But, how did we get this increase? Part of it was by using more fertilizer and lime. We used better varieties as well, but the great big reason for the increase was the fact that we plowed up more acres. We grew corn and soybeans instead of hay and pasture. All of this helped to speed up the loss of organic matter from our soil and hastened the process that leads to land that is hard to work, slow to drain and low in producing ability.

Just how serious is this loss of organic matter? For the answer to this question let's take a look at some of the work of our own Ohio Experiment Station. One set of plots at the Paulding farm is typical of results in many other locations and on other types of soil. These plots show how important good sod crops are if yields are to be high.

At Paulding, over a six-year period, a rotation of corn, oats and two years of alfalfa-brome grass resulted in an average corn yield of 69 bushels of corn. A four-year corn, oats, alfalfa, alfalfa rotation produced an average corn yield of 66 bushels. A three-year corn, oats and alfalfa rotation produced a corn yield of 59½ bushels.

When the rotation was cut down to a corn, oats and sweet clover residue rotation, the corn

yield dropped to 57 bushels. When the rotation was shortened to corn and oats, with all residue plowed back the corn yield fell even further— to an average of 51 bushels. What about corn every year? The yield there was a mere 26 bushels!

This experiment points out what happens when we get too high a percentage of our farm land in cultivated crops. The physical condition of the soil becomes poorer, yields suffer, and then we may plow up even more land in an effort to keep the total corn yield at the same level. It's all a vicious spiral. Perhaps the answer lies in the other direction—grow more sod crops to add more organic matter to the ground and thus increase crop yields.

Robert E. Yoder of the Ohio Experiment Station has spent a lot of time studying what is happening to our Ohio soils and how that affects total crop production. He says the question for a lot of farmers may be this: "Should I continue to struggle with land in poor health as a result of overcropping to corn and soybeans—or should I get back control over soil structure by balancing my cropping system and allowing legume-grass sods to rebuild that favorable soil condition known as good tilth?"

Just how much these good sod crops in the rotation help in keeping up yields is illustrated by a series of long-time experiments at Wooster. There one five-year rotation has had corn, wheat and three years of alfalfa-timothy. The corn in that rotation has averaged over 80 bushels per acre. Another rotation on adjoining plots has had three years of corn followed by wheat and a legume meadow. In this second rotation the corn the first of the three years has averaged about 70 bushels, falling to about 65 and 55 the second and third years. The extra organic matter supplied by the sod crops in the first rotation is the thing that made the difference. The wheat and hay yields for the first rotation were also correspondingly higher than in the second rotation.

Yoder describes organic matter as the life blood of the soil and says that legume roots are the easiest source of organic matter. He goes on to explain that in turning under a good sod you plow back about as much organic matter as is removed from the field in a good crop of hay. It's little wonder then that rotations having good legume-grass sods to turn under will produce the best crop yields.

And, not only do these good sod crops add the organic matter for larger yields but they're also the best insurance that tile lines will continue to operate. It's estimated that Ohio has something like five million acres of land that is tile

drained. If the original cost of this drainage were as little as $30 per acre, this means an investment of at least 150 million dollars. When the organic matter is gone these tile lines are all but useless. Then, to protect this big investment, if for no other reason, it's good business to keep adding more organic matter in the form of good sods to plow under.

What can a farmer do to keep this valuable organic matter from getting away? Yoder points out that a good start is to see that every acre of small grains is seeded to a legume for meadow, to pasture or to plow under.

If we are to keep our soils at the point where they can continue to be productive, we must follow rotations with plently of good sod crops to turn under. We must shift some of our cultivated crop land into growing legume-grass sod crops. We'll have to apply more lime than we have in recent years. And, what's just as important, we'll have to follow good conservation farming methods to keep all of the fertile topsoil we have left.

Computer for Dairy Records

University of Wisconsin has a timesaving computer to aid accuracy in Dairy Herd Improvement Association records. It is 9 pages of tabulated figures. Down 1 side of each page are numbers of pounds of milk produced daily. Across the top is a row of figures representing the test. By reading across from the pounds produced and down from the test, fieldmen can determine pounds of butterfat for each month.

—Capper's Farmer

Nutritional Anemia in Farm Animals

Condensed from Nutrition News Bulletin

A MILD degree of anemia is not uncommon in some species of farm animals during the suckling stage. The condition sometimes develops to the pathological stage before weaning with resultant high mortality or permanent injury to the heart, liver and other organs, leading to impaired efficiency in later life. Anemia in older grazing animals has been reported from several foreign countries and is now recognized as a prevalent condition in grazing cattle and sheep in several sections of the United States and Canada, including restricted areas lying along the Atlantic Coast from Florida to Maine, along the Northern border states to as far west as Minnesota, in California and Illinois, and also in some of the provinces of Western Canada. It is possible that such areas may be more widespread than is suspected. The condition is deemed to be of sufficient economic importance to warrant a review of what is known about its causes and methods of prevention.

Anemia in suckling animals restricted to a milk diet usually develops in fast growing animals like the rat, pig, rabbit, and dog, by the third week of life. The condition develops less rapidly in slower growing animals like the calf, foal, and human infant and is not as likely to reach the pathological stage unless the milk diet is unduly prolonged. For example, the rat which increases in body weight by as much as six times between birth and weaning becomes severely anemic on a straight milk diet by the third week of life. At this age the hemoglobin level in rat blood may be as low as one-half normal. In the case of the pig which sometimes increases in body weight by as much as twenty times between birth and weaning, the hemoglobin at three weeks may be as low as one-fourth normal. By contrast the slower growing calf and foal maintain a nearly normal hemoglobin level up to 12 to 16 weeks of age and the human infant remains normal up to age five to six months by which time it has doubled its weight.

Anemia in suckling animals restricted to milk diet is due to a deficiency of both iron and copper as was first demonstrated for the latter element by Hart and associates at the University of Wiscon-

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sin. Milk normally contains less than two parts of iron and .2 parts of copper per million, amounts inadequate for the formation of new hemoglobin required by a fast growing animal. The small amounts of the two elements normally present in milk can not be increased appreciably through feeding.

The danger of anemia developing to a pathological stage in suckling pigs was first recognized at the Rowett Research Institute, Aberdeen, Scotland, in 1923, when it was observed that pigs reared with sows kept on floors became severely anemic by the third week of life. Typical symptoms beginning to appear by the second week were a dull and listless attitude, drooping heads and eyelids, limp tails and abnormal hair, progressing into pale colored skins, labored breathing (thumps) and sudden death. Autopsy showed enlarged hearts and degenerative changes in the liver and other organs. By contrast, these symptoms of severe anemia did not develop in pigs kept on dirt floors. The findings at the Rowett Institute have been confirmed by several American investigators.

Changes in the hemoglobin content of the blood of pigs kept with sows on a concrete pavement as contrasted with that of pigs kept with sows on an unpaved lot and with sows on pasture are illustrated by the following data from an experiment at the Purina Research Farm.

The low hemoglobin content of the blood of pigs in Pen 1 is typical of what usually occurs in pigs kept on concrete or wooden floors or on frozen ground. Pigs that survive under these conditions begin to recover when they begin to eat some of the sow's ration but recovery is slow and growth is subnormal. The slight drop in hemoglobin observed in Pens 2 and 3 during the first two weeks of life is typical of what occurs when pigs have access to soil. It appears they are able to obtain

	HEMOGLOBIN (Average in grams per 100 c.c. of whole blood			BODY WEIGHTS (Average in pounds)		
Age, Weeks	Pen 1 Concrete	Pen 2 Unpaved Dry Lot	Pen 3 Pasture	Pen 1 Concrete	Pen 2 Unpaved Dry Lot	Pen 3 Pasture
Birth.....	10.1	9.0	7.4	2.8	2.8	2.6
1.....	7.1	8.8	7.8	4.9	4.7	4.3
2.....	5.2	9.9	9.6	7.9	7.8	7.6
3.....	5.1	11.6	9.5	10.4	10.1	11.2
4.....	4.9	10.4	10.2	12.9	12.4	14.4
5.....	4.8	11.2	10.1	14.8	14.8	17.3
6.....	4.8	11.3	11.2	17.3	17.8	20.9
7.....	5.8	11.9	9.9	19.3	20.6	28.8
8.....	7.2	11.1	10.6	21.3	25.3	30.2
9.....	7.7	11.5	10.6	23.6	29.7	36.4
10.....	7.9	10.9	11.1	26.4	35.5	41.8

sufficient iron and copper to maintain a nearly normal hemoglobin level even at this eary age. By age four to five weeks, they are active enough to obtain from the soil all the copper and iron needed for a normal rate of hemoglobin formation. The effect of the hemoglobin level on growth rate is quite marked as shown in the table, only 26.4 lbs. at age ten weeks for Pen 1 as contrasted with 35.5 lbs. for Pen 2 and 41.8 lbs. for Pen 3.

The table shows that the pigs in Pen 1, even when they were old enough to eat some of the sow's ration were unable to obtain enough iron and copper for as rapid hemoglobin formation as was obtained by the pigs with free access to soil. This suggests that iron and copper obtained by rooting in dirt were more available than as found in the feed, or that some other unknown substance obtained from the soil tended to make them more readily available.

The pig seems to be the only domestic animal in which suckling anemia due to iron and copper deficiency develops to a pathological stage, at least under practical rearing conditions. However, the danger of such development should be kept in mind when other fast growing species are reared under abnormal conditions, particularly when the nursing period is unduly prolonged and there is no chance of contact with outside sources of iron and copper.

The usual recommendation for pigs on floors is that they have access to a few shovels of loose earth not contaminated by hogs. This is usually sufficient. The recommended treatment for the cure of anemia in pigs is the oral administration of medicinal iron and copper preparations at the rate of 25 milligrams of iron and 5 milligrams of copper per pig per day.

Anemia in grazing cattle and sheep described in the literature under such names as "Burtonail," "Bush Sickness," "Morton Mains Disease," Enzootic Marasmus," "Nakuruitis," "Pining Disease" and "Grand Traverse Disease" formerly ascribed to an iron deficiency and later to a multiple deficiency of iron, copper and nickel in the herbage are now known to be due to a simple cobalt deficiency and they can be cured by the administration of small amounts of chemically pure cobalt compounds.

The first symptom of cobalt deficiency is a loss of appetite and the final picture after several months grazing on unsound pastures is indistinguishable from chronic starvation. The deficiency occurs on a wide variety of soils of different geological origin including granitic, sandy and limestone. The effects begin to appear in sheep when the cobalt content of the herbage is as low as .07 parts per million (dry basis) and

in cattle at around .03 to .04 parts per million. Horses seem not to be affected. Simple cobalt deficiency is most readily diagnosed by the dramatic recovery of appetite and improvement in condition following the administration of a chemically pure cobalt compound free from traces of iron and copper.

Cobalt deficiency was reported to be especially severe in six counties in the Grand Traverse area of Michigan in the winter of 1940–1941. The cattle in this area became unthrifty, developed morbid appetites, became extremely emaciated and practically refused to eat. Newborn calves dwindled and died within two to six weeks and after calving, the cows sank rapidly. All of this occured in cows on good grain rations and excellent looking alfalfa hay. Hemoglobin determinations on the blood of these cattle, and cobalt determinations on the alfalfa hay gave the following results as compared with healthy cows at East Lansing.

	Affected Cattle Grand Traverse Area	Healthy Cattle College Herd East Lansing
Hemoglobin (grams per 100 c.c.)		
Severely emaciated	6 to 8	
Mildly affected	8 to 10	
Not affected (average)		13
Cobalt in Alfalfa Hay, ppm	.03 to .06	0.12

The administration of cobalt to the affected cattle resulted in a spectacular recovery of appetite within three to ten days followed by marked improvement, and milk production.

Simple cobalt deficiency has not been reported in any animals other than cows and sheep. Its function in nutrition is obscure. It has been suggested that it is required by the micro flora of the rumen rather than by the animal. This is supported by an observation by H. A. Keener of the New Hampshire Experiment Station that cobalt is effective in relieving deficiency symptoms when given orally but not when injected into the blood stream. Experiments at the University of Wisconsin indicate some amelioration in the symptoms of cobalt deficiency following the injection of thiamin and pyridoxine, but not as good a response as from cobalt.

Cobalt sulfate is generally recommended as a suitable source of cobalt in animal feeding. The exact amounts required for protection against deficiency have not been accurately determined. The recommended therapeutic treatment for a mature cow is to add to her drinking water, over a two week period, one tablespoon per day of a solution of 1 ounce of cobalt sulfate in one gallon of water supplemented by free access

to a salt mixture containing one-half ounce of cobalt sulfate to 100 pounds of salt. (New Hampshire Exp. Sta. Circular No. 68, 1944). For severely affected calves the recommendation is for 2 tablespoons per day for two weeks followed by 1 tablespoon per day until the animal is old enough to lick the cobalt-salt mixture. Excessive amounts of cobalt are stated to be toxic and should be avoided.

Anemia, accompanied with the usual lack of condition, occurs in cattle and sheep and to a less extent in foals confined to pasture grasses containing less than 3 parts of copper per million. Such grasses are known to occur in areas widely scattered throughout the world. Anemia may also develop on grasses containing as high as 7 to 8 parts of copper per million due to the presence of excessive amounts of calcium, lead, molybdenum, or other elements that interfere with copper utilization. Forages high in molybdenum, running from 10 to 100 parts per million have been observed in Florida and California.

Observations of animals on copper deficient grasses suggest that the element may have functions in nutrition other than hemoglobin formation. Scouring, ataxia, sway-back, abnormal wool growth, degeneration of the spinal cord and brain tissue, Falling Disease, and sudden death have been ascribed to simple copper deficiency. Such diagnosis is supported by abnormally low concentrations of copper occurring in the liver, blood and milk of affected animals and by favorable response to treatment with salt containing 1 per cent of copper sulfate.

A recent paper from Australia, states that the first specific and easily discernible symptom of copper deficiency in sheep is a loss of crimp in the wool which after a time became straight and characterless. This condition is wide spread in South Australia in sheep affected with "coast disease" a malady due to a dual deficiency of copper and cobalt. It is clearly demonstrated that the wool condition is due to copper and not to cobalt deficiency and can be prevented by the administration of 5 mg. of copper daily. The paper also points out that the continued administration of copper at the rate of 50 mg. per day finally produces symptoms of copper poisoning.

A wasting disease due to a deficiency of both cobalt and copper has been reported to be prevalent in cows, sheep, goats and swine pastured on certain restricted areas in Australia and Florida. The symptoms are pretty much the same as for simple cobalt deficiency, *viz.*, loss of appetite, lethargy, weakness, retarded growth,

retarded sexual development, emaciation, depraved appetite, and other signs of general malnutrition. In Australia the condition is called "Coast Disease" and in Florida "Salt Sick." In Australia horses are also affected, particularly foals.

Blood examinations of affected animals show a pale color, a reduced blood volume, and generally, but not always, a low hemoglobin. The following blood data were obtained by Neal and Becker of the Florida Agricultural Exp. Station:

Average Hemoglobin per 100 c.c. of Blood

	Healthy Cows	Salt Sick Cows
Calves	11.68	5.92
Yearlings	13.34	8.38
Over 2 years old ..	13.57	9.04
Over 12 years		4.81

In some cases, the hemoglobin level in affected cows was higher than in healthy cows, but this was ascribed to the greatly reduced blood volume. Following the administration of cobalt and copper compounds there was sometimes a temporary drop in hemoglobin due to a more rapid increase in blood volume than in hemoglobin formation. With continued administration of cobalt and copper, both the blood volume and hemoglobin attain normal values.

For cobalt-copper deficiency in pastures it is recommended that animals be allowed free access to salt containing ½ ounce of cobalt sulphate and 10 ounces of copper sulphate per 100 pounds of salt. The sulphates should be evenly mixed in the salt to prevent an animal from getting too much. The salt mixture formerly recommended by the Florida Agr. Exp. Station for "Salt Sick Cattle" also contained iron compounds. At that time, it was not realized that the efficacy of the iron compounds was due to contamination with cobalt. It is doubtful whether any forages in Florida or elsewhere are ever deficient in iron.

As stated above, amelioration of anemia due to cobalt deficiency in cattle following the injection of some of the water soluble vitamins, together with the fact that cobalt is effective only when administered orally, suggests this element is necessary for the rumen synthesis of some of the water soluble vitamins including thiamin, niacin, and pyridoxine. However, it has not been shown that these water soluble vitamins have a definite role in hemoglobin formation.

It has also been suggested that Vitamin B_1 deficiency plays an important role in the development of infectious anemia, swamp fever, in horses. This disease occurs mainly in horses pastured in low lying, poorly drained, wooded areas and in marshy areas at high altitudes. It has been observed in Sweden and Finland that the soils of such areas are acid in reaction and the grasses grown thereon ab-

normally high in manganese and low in Vitamin B_1, probably the result of the oxidative nature of manganese on the Vitamin. The Finnish investigators suggest that the oedema, emaciation and ataxia observed in horses on these areas is a "forage anemia" and that the fever which later develops is the result of a virus infection. In support of this idea is the observation at the North Dakota Exp. Station as early as 1923 that sound horses inoculated with the blood of swamp fever horses from wooded areas, in most cases develop fever but not anemia symptoms. It would seem that the virus infection is not the primary cause of anemia but is the result of a lowered resistance due to the anemia. However, the Finnish data are not extensive enough to warrant definite conclusions.

On the other hand, it has been shown that pernicious anemia in man (a macrocytic hyperchromic type as contrasted with the microcytic hyperchromic type that responds so readily to iron-copper treatment) responds readily to treatment with small dosages of the recently discovered folic acid and also to very much smaller doses of the still more recently isolated vitamin B. However, pernicious anemia has not been recognized as a problem of importance in domestic farm animals.

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Flies Building Up Resistance to DDT Spray

Condensed from New Jersey Agriculture

WIDESPREAD difficulties in the control of house flies with DDT have been reported to the Department of Entomology this year. Pest control operators have complained that the DDT seems to have lost its power to kill flies.

Farmers have reported the same trouble with sprays applied to dairy barn milking rooms. It also appears that DDT is no longer as effective against some vegetable insects as it was last year and the year before.

House flies captured in a New York resort hotel may have provided the answer to this problem. In laboratory tests these flies were definitely resistant to a double dose of DDT, while flies of a normal strain were killed 100 percent by the same treatments.

It all began when a New York exterminator asked Rutgers entomologists why three applications of DDT residual spray made within one month failed to give control, while a single spray had given excellent results in two previous years. The entomologists couldn't find any flaws in the exterminator's methods. When they brought the flies back to the laboratory they found that they were highly resistant to the DDT.

What apparently happened was that a process of natural selection operated over the 3-year period to build up a strain of flies which can withstand ordinary doses of the poison without serious effects.

The same thing seems to be happening with other insects. If the trend continues, it is possible that DDT will no longer be considered a "miracle" insecticide.

Drs. Elton J. Hansens and John B. Schmitt of the Entomology Department point out, however, that there may be other reasons for the poor performance of DDT this season. 1.) Conditions for fly breeding in 1948 were excellent and consequently there have been much greater numbers of flies present than for the previous two years. 2.) Excellent control obtained formerly has led many persons to be lax in using DDT. In many places the DDT has been applied carelessly or to only small portions of the buildings. Residual DDT sprays must be applied carefully and thoroughly to achieve good fly control.

In laboratory tests, according to Drs. Hansens and Schmitt, Chlordane has been effective in killing

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any flies that are resistant to DDT. This is available under a variety of trade names. Chlordane is somewhat more expensive, does not kill flies as quickly, and does not give as long lasting fly control as DDT formerly did.

From ½ to 2 percent Chlordane emulsion is reported to give excellent fly control for a month or more when applied in the same manner as DDT—that is, at the rate of a gallon to each 1,000 square feet of surface.

Newest Methods of Packaging Poultry

Condensed from American Poultry Journal

G. T. Klein
University of Massachusetts

THAT "New Look" in packaged chickens was not decreed by Paris. The dress that adorns our ready-to-market chicken fits her skin tightly as though she were melted and poured into it. There's no padding, no extras. But just the same, it makes an attractive, pleasing job.

And this really does give dressed poultry a "New Look." The bird is completely picked with no primaries for the housewife to wrestle with, no pins and hair to consume her time. The neck is closely cut off near the body, the crop is removed, feet are cut off and discarded, and liver, gizzard and heart are carefully cleaned and wrapped in a paper along with the neck. These go in the body cavity which has been carefully cleaned of intestines, lungs and all.

That old look is altogether too familiar to the consumer. In the display case, is a bird with a bloody head and neck, dirty feet, intestines still in. If a housewife has courage to buy one, she must endure seeing the meat man chop off the inedibles and pull out the intestines and separate the parts. When she gets home, the memory lingers, and other members of the family eat most of it; she doesn't have courage to buy another chicken for some weeks.

Packaging poultry has to start long before the bird goes into its protective coating. First comes clean picking and scalding at temperatures that won't cause burning. The right temperature is

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just as low as you can have it and yet do the job without spending too much time on it. For broilers, it's about 125 degrees for about 30 seconds, fryers a degree or two warmer, and roasters about 128 degrees for the 30 seconds. Hens or fowl can take about 130 degrees. Turkeys start at about 125 degrees and move upward with age. Trials and observations can't be beaten for working out exact details. A picking machine is the only practical way for handling a volume of poultry.

If you were to ask Randolph Buxton, North Acton, Mass., why home dressers of poultry get complaints of strong odors and flavors, he would tell you it's because poultrymen don't cool their poultry right. It's Buxton's business to service this kind of equipment and see that his clients put out chickens and turkeys that please customers. He would tell you strong odors come from the intestines and are caused by trying to chill the dressed birds in water entirely too warm, by leaving them in water too short a time, not covering them with water, and the like. Buxton uses a milk cooler on his own farm. He can fill this with water, set it just above freezing and do a complete job of cooling the inside of the bird to from 35 degrees to 38 degrees. There's no guess work with him. A thermometer inserted in the vent indicates when the temperature is safe.

When the middle 30's or even 40 degrees is reached, the fat is firm enough so that a neat job of drawing and packaging can be done. Buxton draws with a machine, a "Viscerator." A cut along the back of the neck, removal of the neck close to the body and the crop, then a cut around the vent, and a plunger goes through the body cleaning out lungs, intestines, egg sack and all. Next the neck, gizzard, liver and heart are wrapped in waxed paper and inserted in the body cavity.

Now it's time to do the packaging for freezing. There must be a dozen choices. Some are cheaper than others, some are more durable, and some really give chickens and turkeys that "New Look."

First, there's locker paper. It has two surfaces—laminated. An air tight surface goes next to the bird; a waxed surface on the outside. Buxton wraps the package tightly, using the druggist's fold, ties with string, and he says you have the cheapest of the packages. It isn't entirely air tight, especially with poultry, and where air penetrates to the flesh, there will be freezer burn after a couple of months or so.

Buxton has tried a special wax, but here you have a material that

may peel in time and allow air to penetrate. This method may someday be perfected for use in preserving poultry. It is said to have been most efficient as a protective coating for arms and machinery shipped to the Pacific during the last war. It may become one of the leading packaging materials.

There are a number of tin foil types. They do a nice job, are interesting to wrap around the birds, but run toward the expensive class. There are the transparent sheets of air proof material which are covered with stockinette to give it a protective covering. Here, again, we have coverings which cannot be sealed and made absolutely air tight. It's an attractive pack, but freezer burn comes sooner than when air can be excluded.

There are the bags of assorted sizes and made of a number of materials that really do the most efficient job and give poultry that stands up longest without freezer burn.

The best of these new materials are tough and can hardly be torn at the seams or elsewhere. However, they cut easily. A careless stick with a knife makes the bag tear and practically useless. A sharp bone is equally as destructive, but knife holes and bone slits are easy enough to prevent. This feature need keep no one from using these bags.

When the bags are neatly stretched over the carcass and the air removed with a vacuum cleaner or special machine, the end is tied and the package is plunged into water at 160 degrees for a few seconds. This shrinks the material, drawing it close to the meat. Here's where the "New Look" comes in. It's the most attractive package I've seen. Prices vary according to the size of the bags, ranging from a few cents for broiler sizes to 20c or more for turkey sizes.

With these materials, we get a peckage in which there is practically no air movement. This reduces freezer burn to a minimum. Tests show practically no marks on poultry held a year or more.

The last steps in the sale or preservation of frozen poultry are the quick freezing at temperatures of 15 degrees to 20 degrees below and holding it at zero. With good packaging, sharp fast freezing and right holding, there is little difference in the quality of fresh and sharp frozen poultry and turkeys.

Where Are New Insecticides Leading Us?

Condensed from N. J. Farm and Garden

Samuel H. Reck

HORNWORMS appeared by the millions in New Jersey tomato fields last August and September and caused great damage. Growers had never seen these pests in such numbers.

What caused the hornworm invasion? According to Dr. Bailey B. Pepper, head of the entomology department at the N. J. Experiment Station, DDT was responsible.

The hornworm population built up in potato fields because growers have turned from calcium arsenate, which controlled hornworms, to DDT, which has little effect on them. The hornworms didn't do much damage to the potatoes, but when the worms reached full size they "pupated" in the ground, the moths emerged and flew to neighboring fields where they laid their eggs on tomatoes, peppers and eggplants. Hornworm moths are strong flyers and can travel as far as 15 to 20 miles in search of a good place to lay their eggs. Tomato growers were warned of the impending invasion of hornworms but many of them suffered considerable loss, all because potato growers are using DDT instead of calcium arsenate. But you can't blame the potato growers when DDT does the job for them and produces higher yields than they were getting with their old spray program.

Fruit growers are experiencing some new troubles, too, also traceable to DDT. Red-banded leaf rollers were never considered a pest on apple trees in New Jersey until DDT came along, but this season they became a real problem. Apple maggots are also on the increase. In both cases the cause seems to be the substitution of DDT for lead arsenate for codling moth control. The New York State Experiment Station recommends DDT for red-banded leaf rollers and apple maggot but it hasn't seemed to give satisfactory results in New Jersey.

Arthur J. Farley, extension pomologist at Rutgers, reports that the use of benzene hexachloride early in the season to control curculio on peaches seems to have aggravated the oriental fruit moth problem by killing off the parasites which help to keep down the

Reprinted by permission from N. J. Farm and Garden, November 1948, Sea Isle City, N. J.

fruit moth. And also, says Farley, the extra leaf growth which is stimulated by the benzene hexachloride has made brown rot more difficult to control.

All of which points to the necessity of proceeding with caution in the use of these new chemicals which are flooding the market.

Dr. Pepper puts it this way. "We're finding how absurd scientists were when they tested DDT on certain specific insects and neglected to determine what the effect would be on the total insect and disease picture. Now we're beginning to condemn good materials, such as DDT, because they have specific weaknesses. DDT is still one of our most useful insecticides —if we use it properly. We've got to take time to do a thorough job of testing these new and potent insecticides to find out just where they fit in. When we've done that we can use these new materials intelligently. We won't be controlling one insect and setting the scene for trouble from two or three others."

The Experiment Stations are doing their best to carry on the job of taking these new materials to the field for testing. But new insecticides are appearing so fast and commercial interests are so eager to cash in on them that they are being used by farmers before the facts about them are known.

Parathion is a case in point. This chemical is one of the new phosphate compounds which shows tremendous promise. It is one of the most powerful insecticides yet developed and seems able to kill almost any insect that is exposed to it. On apples and peaches, for example, Dr. Byrley F. Driggers of the entomology staff has found that it controls those insects that DDT is not effective on—such as red mites, red-banded leaf rollers, plum curculio, and oriental fruit moth. And it doesn't seem to have any harmful effect on most plants, although McIntosh trees may be allergic to it.

However, it is dangerous to use. It is something like 70 times as poisonous to warm-blooded animals as is DDT and it will penetrate the skin. The N. J. Experiment Station has had only two years of experience with it and is not prepared to make any definite recommendations concerning its use.

Despite this fact, it is likely that widespread merchandising of this product will take place next year and that farmers will use it. What the results will be—what new problems will arise—no one can foretell. But one thing is certain —the Experiment Station will not make recommendations until it is sure of its facts. And that requires more than two years of field testing.

Following are some of Dr. Pepper's observations on new insecticides:

DDT.—We still don't know a lot of things about this highly publicized insecticide. It kills many insects and doesn't touch many others. Unfortunately, it is quite toxic to some vegetable crops such as onions, corn, beans, the cucurbits (such as cucumbers), tomatoes and some varieties of peas. When applied to the soil in certain quantities, stunting of some kinds of plants occurs. Some insects tend to increase in numbers on crops treated with DDT, notably the cabbage aphid on DDT-treated plants.

DDD (Rhothane).—This insecticide is in a class with DDT but is only about 1-12 to 1-15 as poisonous to warm-blooded animals. Information to date indicates that it can safely be used on sweet corn for earworm control, and looks promising on beans for the same insect which infests the pods in late summer and early fall. It shows promise in the control of tomato hornworms and red-banded leaf rollers. Like DDT, it causes injury to some of the vegetable crops.

Methoxy DDT.—In our tests we have found it to be very toxic to sweet corn and tomatoes, but it doesn't hurt snap and lima beans and the cucurbits. Unlike DDT and DDD it is effective against the Mexican bean beetle, and therefore is recommended as an alternative for rotenone on beans where Mexican bean beetle, leafhopper and corn earworm are present at the same time. It is not recommended in place of rotenone where only the Mexican bean beetle is concerned. Methoxy DDT is also suggested as an alternative for rotenone and pyrethrum on cucurbit crops for beetle and squash vine borer control.

Benzene Hexachloride.—Forms of this chemical used in the past have had a very disagreeable odor which may be absorbed by the plant. Although it has high toxicity against many insects we cannot recommend it at this time.

Refined and deodorized benzene hexachloride is now appearing and may overcome some of the serious objections experienced with the crude material. It is one of the most outstanding insecticides against aphids, thrips and beetles in general. It has given outstanding control of soil-infesting insects and appears to have a stimulating effect on plant growth, indicating that the material is absorbed into the plant system.

Chlordane.—Seems to have few advantages over DDT, DDD or methoxy DDT. In some experiments it has given good insect control but the crop yields have been disappointing. Further testing is necessary.

Toxaphene (Chlorinated Cam-

phene).—Follows in the same category as Chlordane. Certain vegetable crops seem to be injured or stunted by it.

Hexaethyl Tetraphosphate.—Appears extremely toxic to many insects and mites but breaks down and loses its power in a relatively short time. Kills only the active stages of insects and not the resting stages. Under certain conditions it has caused severe plant injury to beans, tomatoes and eggplants. It is reported to be extremely toxic to man and animals and can be readily absorbed through the skin. From our results to date we cannot advocate its use on vegetable crops.

Tetraethyl Pyrophosphate.—This is several times as powerful as hexaethyl tetraphosphate, but seems to have the same disadvantages.

Parathion.—Discussed earlier in this article. Seems effective against a wide range of insects and doesn't cause plant injury to most crops. Extremely poisonous to warm-blooded animals. Much more work is necessary before any definite recommendations can be made.

Piperonyl Cyclonene and Piperonyl Butoxide.—These synthetic materials are activators for rotenone and pyrethrum. Our results indicate that relatively small concentrations of pyrethrum in combination with one of the piperonyl compounds give results equal to much higher concentrations of pyrethrum used alone. However, the cost is such that it is doubtful whether there is much advantage in cutting down the rotenone or pyrethrum and putting piperonyl in.

Ryania speciosa.—Continues to give good control of European corn borer and also a high degree of control of sweet corn smut.

Summary

None of these new synthetic materials can be considered a universal insecticide since each has certain disadvantages. When we consider the possible hazards involved, such as poisonous residue on crops at harvest, plant injury, and damage to the soil that may result from continued use of such compounds, it is imperative that farmers use them only as recommended by the agricultural experiment stations and federal agencies, and even then only at minimum concentrations and no oftener than absolutely necessary.

More Eggs in the Top Grade

Condensed from Poultry Tribune

Carl O. Dossin
Pennsylvania State College

THE SMALL investment required to make a good egg room will pay large dividends. This is especially true if you sell your eggs on grade or if you produce hatching eggs.

A good egg room is one in which you can maintain a temperature of 50 to 65 degrees Fahrenheit and a relative humidity of 75 percent. If you have an egg room meeting these requirements and follow the other practices recommended in a quality egg program, you can market a high percentage of your eggs in the top grades.

Poultrymen who do not have satisfactory egg rooms generally get only a small percentage of their eggs in the top grade. This is true even in spite of the fact that they may gather their eggs in wire baskets three times a day, carry them to the egg room immediately, pack them the next day, and market them twice a week.

On most farms, eggs are marketed only once or twice a week. That means that they are held several days between the time they are laid and marketed. It *is during this holding period that the egg room has its influence on egg quality.*

In a recent survey, visits were made to poultrymen consigning eggs to some of the egg marketing cooperatives in Pennsylvania to observe their egg handling programs and their egg rooms. At the time the visits were made, all the eggs were being sold on wholesale grades.

In the following table is shown the percentage of the cases of eggs which went into the top or fancy grade. A 10 percent tolerance of eggs in the next lower grade was permitted. The grade was determined by candling 100 eggs in a case rather than by complete candling.

When studying this table, bear in mind that poultrymen who went to the effort to maintain satisfactory temperature and humidity in their egg rooms were quality-egg conscious and would likely carry out the rest of a quality-egg program.

In the other groups, there were some who followed all the other

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steps in such a program except for correct temperature and humidity in the egg room, but even these were not successful in marketing a very high percentage of top grade eggs.

There were no egg rooms with a temperature higher than 75 degrees, but the relative humidity went as low as 45 percent in some instances.

Effect of Egg Room Temperature and Humidity on Egg Quality

No. Farms	Temperature (Degrees F)	Relative Humidity (Percentage)	Percent Fancy
23	Under 65	Over 75	86
11	Over 65	Over 75	76
35	Under 65	Under 75	34
12	Over 65	Under 75	20

One could assume from the table that humidity is far more important than low temperature. Let me repeat again, however, that no egg rooms in the groups that were over 65 degrees Fahrenheit went higher than 75 degrees and the majority of them in these groups approximated 70 degrees in temperature.

There was a range in relative humidity from 45 percent to 75 percent in the groups where the relative humidity was less than 75 percent. *I am trying to emphasize the fact that it is a combination of the two factors and not either one alone that is most important.*

The reason that low temperature is so important is that embryo development starts to take place in fertile eggs at temperatures above 68 degrees. At a temperature of 68 degrees or slightly higher, the development takes place slowly and the embryo soon dies, often resulting in the formation of a rot. In following a quality egg program, all males should be removed from the flock at the close of the hatching season in order to produce infertile eggs.

With infertile eggs, there is no embryo development, of course, but high and changing temperatures may cause a mottled condition of the yolk. High temperatures also cause a flattening of the yolk and a weakening of the white.

When an egg is first laid, there is no air cell. It is formed when the contents of the egg cool and contract. If the moisture in the egg is allowed to evaporate or be drawn into dry egg cases, the air cell becomes still larger. The egg shell also appears mottled under the candle if the eggs have been held in a room with too low humidity. Field observations indicate that a relative humidity of 75 percent in the egg room will prevent excessive evaporation from the eggs and will control egg shell mottling.

Most egg rooms are located in house cellars or in the basement of other buildings because this is usually the coolest place on the farm. Caves and spring houses also have been used satisfactorily,

particularly during the summer months. One objection to these locations is that it usually means carrying the eggs some distance from the laying house. The eggs also have to be carried downstairs to the egg room and then up again when taken to market.

Many poultrymen with large flocks are now building egg rooms in their hen houses. By using sufficient insulation material, some have made satisfactory rooms above ground. In this state, about a dozen poultrymen, particularly breeder hatcherymen who hatch the year around, have found it profitable to install artificial cooling and humidifying units in their egg rooms. These men experience very little difference in their hatchability at any season in the year.

Many poultrymen are now fastening a water pipe near the ceiling along a wall or two in the egg room. This pipe has small holes in it about every six inches. The water is directed against the wall and regulated so that the entire wall is kept wet. A gutter at the floor carries excess water to the drain. A bulge of concrete three to four inches below the pipe and along the entire wall will catch any drip from the pipes when the water is first shut off. If some provision is not made to catch this drip, it may fall on cases racked near the wall.

The egg room should have a tight fitting door, kept closed. Altogether too frequently poultrymen have spent good money on building an egg room, but have neglected this important detail. Lighted bulbs may help to warm up the room, so turn off the lights when you leave.

Molds in the egg room during the summer have been a problem for some folks. Scrubbing the walls and floor with a saturated copper sulphate solution has helped. One of our poultrymen who had such a problem reports that he solved it by installing a germicidal lamp.

An egg room that provides satisfactory conditions of temperature and humidity for holding eggs is not a satisfactory place to work. To overcome this problem, many poultrymen now have two rooms for their egg operations, one for cooling and holding the eggs and the other in which to clean, grade, and pack them.

Cooperative Milking Barns

Condensed from The Utah Farmer

Grant M. Esplin
Beaver County Agent

ABOUT two years ago while three dairymen were on a trip together they discussed the possibility of erecting a cooperative milking barn in Beaver County, Utah. These men became highly interested in the possibilities of such an undertaking and their enthusiasm spread to other Beaver dairymen. After enough dairymen became interested it was possible to go ahead with the project. One of the main advantages of such a dairy barn is that each individual dairyman does not have the expense of building his own dairy barn.

A cooperative was formed in accordance with the laws of Utah. A board of directors was elected and visits were made to various dairies in the northern part of the state to get ideas on various types of barns. After visiting these other dairies, the group made up a plan of its own for a barn to fit the local needs. They combined ideas from various barns that they had visited.

Shares of stock were sold in the barn at $85 a share. A dairyman is allowed to milk one cow in the barn for each share of stock he owns.

The barn was completed and put into operation about March 15, 1947. To the present time the barn corrals, land, and equipment have cost approximately $20,000.

There are corrals to hold the cattle for short periods of time before and after milking. There is a holding room in the barn where cows may be curried and cleaned. From this room the cows go up a ramp in single file to the stanchions where they are milked. The seven stanchions are tandem type and are built about three feet higher than where the men work. This makes it possible for the men to put the milkers on the cows without stooping.

The milk is taken to the weighing room as soon as it is milked. Here it is strained, weighed, and pumped into the next room where it is cooled immediately by passing through a cooler. From there it is moved directly into the refrigeration room. In addition to the mentioned rooms, the barn

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Salt Lake City, Utah

also has a grain room, office, and a room in which to house motors and equipment.

There is a gas motor that can be used to run the milkers in case of power failure of the regular electric motor. Two complete milking machines are in readiness in case one fails.

The association hires three full time men and one part time man. Two of the men do the milking, and one is manager. The manager weighs the milk, does the testing and bookkeeping.

At the present time 165 cows are being milked at the barn. Shares of stock have been sold to 23 members for 250 cows. The size of the barn can be expanded without too great an expense.

A charge of 14 cents a day per cow is made for the milking of the cows. Four pounds of grain are fed each cow a day. The dairyman is charged for this grain.

The association owns two bulls, a Holstein and a Jersey. They plan to buy two more bulls as soon as possible.

At Minersville there is a similar barn and cooperative plan. However, the Minersville setup is somewhat larger, with 305 cows being milked at present. Recently the Minersville cooperative authorized the sale of stock to make a total of 500 shares of stock in the barn. There are now 28 stock holders in this cooperative which has been operating for three years. Equipment and operation procedures are similar to the Beaver concern.

Buy Lime By Quality

Condensed from Wallaces' Farmer and Iowa Homestead

FARMERS need to know more about liming and the effect it has on soils and crops. Just to understand that "liming is good practice" is not enough. All soils are not alike. All limestone is not alike.

There are some questions which farmers should ask before they invest in limestone for their fields. Here are some of them:

What does liming do to the soil?

Liming sweetens the soil. Some emphasize this point. They say that a soil which is not acid favors the growth of beneficial soil bacteria. Inoculation for legumes is more effective.

Reprinted by permission from Wallaces' Farmer and Iowa Homestead, August 21, 1948, Des Moines, Iowa

Others emphasize the point that the calcium in lime is a plant food. All farm crops—and particularly legumes—need the calcium.

All agree that lime in the soil makes it possible to get good stands of alfalfa and the clovers. Then the legumes further improve the soil for growing grain crops.

Tests which have been made at Iowa State College indicate that lime on some soils will increase alfalfa yields one and one-half tons per acre. Corn and oat yields are increased from three to five bushels per acre.

How can a farmer know whether his land needs lime?

Failure to get stands of alfalfa, sweet clover or red clover is a good sign of lime shortage. Short crops of these legumes are also a sign of lime needs.

If these signs of lime shortage in your soil appear, have a test made of the soil. Go to your county extension director for instructions on how to take soil samples and where to send the samples to have them tested, or the soil samples can be sent to the soil testing laboratory in your state.

The lime test is much more simple and much more accurate than soil tests for other plant food needs. The test report will tell you how many tons are needed per acre.

What points should be watched in buying limestone?

Limestone varies in the percentage of calcium carbonate which it contains. This is the plant food and the soil sweetener. Some samples tested in the Iowa Department of Agriculture laboratory have run 45 per cent or lower. Other samples have run 90 and higher.

Fineness of grind is another quality which should be checked. Coarse limestone becomes available very slowly. You need finely ground limestone for benefit within three years.

The percentage of moisture in limestone is an important point to the buyer. Limestone may run 10 per cent moisture or the moisture content may be down to 3 or 4 per cent. The man who buys limestone with 10 per cent moisture is paying for a lot of water.

How does the value of limestone vary according to fineness of grind?

On the basis of benefit to the soil in three years, H. B. Cheney, of Iowa State College, has worked out the values in this way:

Of limestone held on a four-mesh sieve (four spaces per inch), none is available in three years. It won't dissolve in that time.

If held on an eight-mesh sieve, 10 per cent will become available in three years.

If held on a 50-mesh sieve, 40 per cent will be available in three years.

Limestone that goes thru a 50-mesh sieve is 100 per cent available in three years.

In Iowa, the law requires that the limestone buyer must be given a ticket showing the weight, fineness of grind and the percentage of calcium carbonate equivalent. Most states have a similar law. (The Iowa law does not require moisture content to be stated. You have to look out for that yourself.)

To figure the value of the lime, a unit formula which was worked out by Iowa State College men is recommended. Here is the way one sample was worked out by J. E. McCambridge, department chemist.

Ten per cent was retained on the eight-mesh sieve. This is 10 per cent available in three years. In 100 pounds, there would be one pound available.

Fifty per cent was retained on an eight-mesh sieve. As this is 40 per cent available in three years, the total for 100 pounds would be 20 pounds.

Forty per cent of the sample passed thru a 50-mesh sieve. All of this is effective in the first three years.

The total for this sample was 61 pounds out of 100 pounds of limestone that would be effective in three years' time.

Then, as the sample contained 90 per cent calcium carbonate equivalent, units of effective calcium carbonate would be 61 pounds times 90 per cent, or 54.

This unit value can be figured for each ticket. It should enable farmers to compare limestone values.

Year-Around Stump Treatment

Condensed from Down To Earth

Keith C. Barrons and L. L. Coulter

THE CONTROL of woody plant growth by treating cut stumps with 2,4-D was first suggested in 1946. Since then experiments by a number of investigators have indicated that this is an economical and successful method often resulting in greater progress toward eradication than a single foliage spray. Some resprouting will occur, particularly from the root-suckering types such as sassafras, and from the more resistant species including certain oaks.

Reprinted by permission from Down To Earth, Dow Chemical Company, Midland, Michigan

However, total regrowth in treated areas may be reduced by 75%.

The writers have made successful treatments with Esteron 44 in fuel oil at various seasons including midwinter when the thermometer registered close to zero. Astonishingly good results have been obtained from these dormant season applications. Although there has been some variation in results between the many treatments made over a three-year period the differences appear to be related to factors other than season. We suggest stump treatment following cutting at any time of the year.

The use of Esteron 44 for stump treatment during winter, fall, or early spring adds greatly to the versatility of this material for vegetation control. Farmers who have no time in summer for spraying brush in pastures, highway departments in cotton country where summer spraying may jeopardize adjacent crops, or railroad people who may have extra section hands available when winter prevents many track maintenance operations, can make use of this method of reducing regrowth from unwanted brush. Stump treatment may also prove valuable in eliminating undesirable species from mixed stands of forest trees.

The dormant season is traditionally the time for many brush clearing operations and the use of Esteron 44 in oil for stump treatment makes it possible to realize substantial progress toward the eradication of many species. One man with a knapsack sprayer, thoroughly wetting each stub and stump can keep up with a sizable cutting crew. Chemical costs and labor requirements are low.

On species that are susceptible to 2,4-D a solution of one percent Esteron 44 in fuel oil or kerosene has given excellent results. Some of the species that are intermediate in resistance probably can be controlled better with a two percent Esteron 44 solution and this concentration is suggested for general use. Some investigators found a five percent concentration may be effective on the more resistant species.

In 1947 Dow research workers discovered that 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) is very effective as a foliage spray on certain species that are resistant to 2,4-D. Among these are are Osage orange and various members of the genus Rubus including wild blackberry. An isopropyl ester formulation of 2,4,5-T called Esteron 245 is now available in limited quantities and is being used along with Esteron 44 for foliage spraying in brush control operations throughout the Appalachian region where wild blackberry is a serious problem. Esteron 245 has proved equally

as effective as Esteron 44 on a number of species and will undoubtedly prove more effective on many in addition to those mentioned above. This new herbicide has proved desirable for stump treatment, and where 2,4-D-resistant species are known to occur a mixture of one percent Esteron 44, one percent Esteron 245 and 98 percent oil is suggested.

A number of organic solvents have been tested as carriers and none has proved better than kerosene, Diesel oil, and the various grades of fuel oil. For foliage spraying, the Esteron should be applied in water according to label directions.

Although good results have been obtained when the treatment is delayed for some time there are indications that application soon after cutting results in the killing of more tissue from which new shoots can arise. Small stumps and stubs are easier to see soon after cutting and a quick follow-up behind clearing operations is desirable. Experiment with stumps of various heights have indicated that the downward movement of the material is not without limit and lower cuts mean fewer suckers.

A knapsack sprayer fitted with a fan-type weed nozzle of medium orifice size is suggested. Pressures need not be high so very little pumping is required. A quick shut-off value will help conserve the solution. A single but thorough wetting of the cut surface and the bark down to the ground line will do the job. Some absorption through the bark of young growth is definitely known to take place. Small suckers or saplings that may be missed by the brush hook or axe should be wet with the solution.

Regardless of the method used, a follow-up treatment pays dividends. Continuous maintenance thereafter on a triennial basis will prevent new seedlings and recovering old growth from gaining a foothold.

Make Fence Posts Last Longer

Condensed from Farm Journal

O. A. Fitzgerald

Good fences are important, but farmers have found that the durable woods like locust and cedar are hard to get. Digging holes and setting posts is just too much like hard work to settle for a short-lived post.

But the picture isn't all dark. A new "fountain of youth" for fence-posts is being used by thousands of farmers. Most common is the 55-gallon oil drum filled with one gallon of pentachlorphenol concentrate to each 10 gallons of stove or distillate oil.

Probably the greatest boom in post treating has been in Pacific Northwest. In Idaho alone, last year, farmers bought enough "penta" to cold-soak 750,000 posts. That's 15 times the number treated in 1944, when University folks first started talking about the magic of penta.

Today the life of a pine fence post in Idaho begins at 15. Four or five years used to be a ripe old age.

For many years, creosote was the one really good post preservative. Then a few years ago pentachlorphenol was developed. It was as good as creosote in keeping out rot and insects, yet was almost colorless, and could be painted over. And it stayed in the wood.

Although penta is clean, safe, cheap, and easy to use, there are a few points to know about it. Getting 20 to 25 years' life out of a fence post involves more than sticking it in a drum filled with preservative. The seasoning is almost as important as the bath itself.

All posts must be peeled. The preservative will not go through the bark. Many farmers like to cut posts in spring or early summer, when they peel the easiest. Following a summer of seasoning (in the shade), they can be treated after harvest. There should be enough seasoning to reduce the moisture so that the post is only half or two-thirds its green weight.

Slow seasoning reduces the tendency of the post to form a hard shell, difficult for the preservative to penetrate. Standing dead wood is ideal for treatment, although peeling is harder. Dry dead wood can be treated immediately after cutting.

How long does it take to treat posts? That will depend upon the

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wood, the seasoning, and the temperature.

It is easy to check the correct treating time by seeing the penetration depth at various periods of soaking. Since penta is colorless, a bright colored dye added to the solution will clearly show the depth. ¾ inch is enough.

The average farm post lasts about three years. Throughout the country that means that each farm replaces at least 100 posts a year. Figuring 50 cents a post, and 25 cents for getting it into the ground, that's $75 post expense per farm each year.

That same 50-cent post, treated with 10 cents' worth of penta, might easily last seven times as long. Instead of spending $1500 for posts over a 20-year period, you could get by for $250.

These figures are averages, but will give you a basis for checking how much post-treating might save you.

Your County Agent or State Agricultural College can tell you in detail how to treat post woods you may have.

Perhaps with a penta bath some of the trees in your farm windbreak can be used for long-life posts.

Hard Seeds in Legumes

Condensed from Farm Research

M. T. Munn
N. Y. Agricultural Experiment Station, Geneva

MANY farmers have benefited greatly thru the presence of so-called "hard seeds" in legumes such as alfalfa and all the clovers. New seedlings have been replenished and even entirely replaced, and valuable volunteer stands secured. On the other hand, sweet clover has appeared in alfalfa seedings, and vetch in wheat as an objectionable weed, all from these hard seeds which have found their way into the soil in some manner at some time.

The hard seeds are those which have such a hard or impermeable seed coat that water cannot enter to start the germination process. The percentage of such seeds may vary from none to a very high percentage depending upon the season harvested, method of storage, and method of threshing.

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The hard seed percentage is often higher in combine-harvested seed than in huller threshed. Mechanical scarification has been used to reduce the hard seed content, however, and that practice has distinct disadvantages. When a germination test is completed these hard seeds will be found on the test blotters just as hard, sound or firm as they were the day they were placed to germinate. One test showed 30% hard seeds remaining after 70% had germinated out of each 100 seeds in 8 days. Just how long such hard seeds will remain on a moist blotter before they germinate or decay is an open question; however, we have some now 5 years on such blotters and they are still germinating from time to time.

The key experiment herein reported was started over 25 years ago when the hard seeds of alfalfa, alsike and red clover, and sweet clover were scraped off the blotters and into glass jars of water. As months and years went by seeds germinated and were removed. Others decayed and were removed as the water was changed from time to time. The alfalfa and the sweet clover hard seeds remained alive during a five-year period of soaking and might have lived even longer since by this time they all germinated. The alsike clover and the red clover seed lived fully 25 years and might have gone on longer had the experiment not been terminated by taking out the remaining hard seeds, placing them on a moist blotter, nicking the seed coats very lightly and carefully with a sharp scalpel after which they all germinated immediately. As far as could be detected the seedlings were as thrifty and normal as any could be. All experiments and experience indicate that such would be the case in the soil.

This experiment concerning the longevity of hard seeds in these clovers and in alfalfa seed confirms and explains what has happened so frequently in farm practice when volunteer stands of these clovers have appeared either to the benefit or possibly the detriment of the farmer. In central New York, where alsike clover seed production is quite common, some entirely unexpected and complete stands of this clover have been secured with excellent seed crops. A considerable number of such cases have been fully substantiated. One, in which the clover straw from the huller was dumped in a pile in 1907 and when distributed over a field in 1936, 29 years later, produced an excellent full stand of clover.

On the other hand when sweet clover appears in a new seeding of alfalfa the owner may quite erroneously blame the last seed sown. In reality, the hard seeds of the sweet clover from a previous

crop, from litter or manure, were already there in the soil only awaiting the opportunity to germinate and become established along with the alfalfa crop. One such case near the Station which involved a 13 year period was fully established.

In like manner wheat growers who get vetch (another legume seed) into their wheat have these hard seeds to blame for the occurrence. It is known that such will live or remain intact and dormant at least 18 if not 20 years in the soil. There is nothing mysterious about these hard seeds when one understands what they are and how they behave in the soil. Most farmers do not regard hard seeds as a handicap of any kind, in fact it is an advantage to have hard seed since it furnishes what amounts to insurance in getting stands.

Repeatedly cases have been investigated where plantings would have been failures had it not been for the hard seeds. In one case investigated, a field had been two-thirds planted with a stock of alfalfa seed which was treated to reduce the hard seed content to practically zero and to finish the planting that day the farmer rushed to a seed store where he got a stock carrying about 30% hard seeds and thus finished the field. Both lots started nicely but the weather turned unfavorable and the first stand was entirely burned and blown out. Later, on the portion of the field seeded with the hard seed bearing stock a complete second stand appeared after a rain, whereas the other portion of the field having no residual hard seeds was a blank.

Both Ladino clover and the native Birdsfoot Trefoil seed carry a high percentage of hard seeds, a distinct advantage. The point is that in all these cases the planter must understand that the total live seed content, that is, the germination percentage, plus the hard seed content as shown on the tag, is the important item.

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GLENN FRANK

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